

Comparative Analysis of The Essential Chemical Components in Two Commercial Antibiotics

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ABSTRACT

The experiment was carried out to comparatively analyze the active ingredients present in Ampiclox and Amoxicillin. The experiment was successfully carried out using standard analytical methods. The result obtained showed no significance difference in the absorbance of the samples tested. The experiment shows that the quantities of the samples for Ampiclox are 682mg for Beecham, 690mg for Reichlox and 740mg for vadiclox while for Amoxicillin are 461mg for Vamoxil, 463mg for Noxil and 463mg for GSK. The result obtained shows that the quantity obtained for the Ampiclox samples were higher than the label quantity of 500mg while the quantity obtained for the Amoxicillin samples were lower than the label quantity of 500mg. It was however suggested that more studies should be carried out on this topic and also the purity of active ingredients imported from abroad should always be investigated and determined properly as it affects the quality of drugs produced with them.

1.0 INTRODUCTION

An antibiotic is a type of antimicrobial substance active against bacteria. It is the most important type of anti-bacterial agent for fighting bacterial infections and antibiotic medications are widely used in the treatment and protection of such infections (NHS, 2014). They may either kill or inhibit the growth of bacteria. A limited number of antibiotic also possess antiprotozoal activity (Grould, 2016). Antibiotics are not effective against viruses such as the common cold or influenza; drugs which inhibits viruses are called anti viral drugs or antiviral rather than antibiotic (Brooks, 2015).

The term antibiotics was coined from the word “antibiosis” which literally means “against life” In the past, antibiotics were considered to be organic compound produced by one microorganism which are toxic to other microorganisms (Russell, 2004). As a result of this notion, an antibiotic was originally broadly defined as a substance produced by one microorganism (Denyer *et al.*, 2004), or of biological origin (Schlegel, 2003) which at low concentrations can inhibit the growth of or are lethal to other microorganisms (Rusell, 2004).

However this distinction has been modified in modern times, to include antimicrobial that are also produced partly or wholly through synthetic means. Whilst some antibiotics are able to completely kill other bacteria, some are only able to inhibit their growth. Those that kill bacteria are termed bactericidal while those that inhibit bacterial growth are termed bacteriostatic (Walsh, 2003). Although antibiotics generally refers to antibacterial compounds are differentiated as antibacterials, antifungals and antivirals to reflect the group of microorganism they antagonize (Brooks *et al.*, 2004; Rusell, 2004). Penicillin was the first antibiotics discovered in september 1928 by an English b Bacteriologist, late sir Alex Fleming who accidentally obtained the antibiotic from a soil inhibiting fungus penicillium notatum but its discovery was first reported in 1929 and clinical trials first conducted on humans in 1940 (Rusell, 2004; Schlegel, 2003).

The main aim of this study is to comparatively analyze the essential components in two commercial antibiotics; Ampiclox, and Amoxicillin from three different brands such as Beecham, Reichlox, Vadisclox, GSK, Vamoxil and Noxil. The result from this study will be beneficial to the researcher and the general public as it will provide knowledge on the basic component of an antibiotic.

The result will also serve as a reference to researchers who wish to venture into similar topic. How to determine the essential components in the two antibiotics such Ampiclox and Amoxicillin from three different brands.

How to analyze the essential components in two antibiotics such as Ampiclox and Amoxicillin from three different brands. An antibiotic also called an antibacterial is a type of antimicrobial drug used in the treatment and prevention of bacterial infections (NHS, 2015). They may either kill or inhibit the growth of bacteria. A limited number of antibiotic also possess antiprotozoal activity (Wiley, 2012). Antibiotics are not effective against viruses such as the common cold or influenza; drugs which inhibits viruses are term antiviral drugs or antivirals rather than antibiotic. Sometimes the term antibiotic (which means “opposing life”) is used to refer to any substance against microbe (AHDEL, 2011).

However, the difference between antibiotics (ie penicillin) and anti microbials (ie Surfonamide) is that the former is produced naturally, while the latter is synthetic (although both maintain the same goal of killing and preventing the growth of microorganisms) Some source distinguish between anti bacterials and antibiotic; antibacterials are used in soap and disinfectants, while antibiotics are used in medicine. (Rane, 2014). Ampiclox capsule is an antibiotic medicine used to treat bacterial infections of the nose, throat, airways, lungs and bone. It contains a combination of Ampicillin and Cloxacillin as active substances that work by stopping the growth of infection causing bacteria. This medicine should be taken in the exact dose and duration as prescribed by the doctor. The entire course of treatment of antibiotics should be completed as incomplete treatment may result in incomplete removal of the infection-causing bacteria from the body (Burley *et al.*, 2006).

Amoxicillin is an antibiotic medication used to treat a number of bacterial infections. These include middle ear infection, strep throat, pneumonia, skin infections, and urinary tract infections among others. It is taken by mouth, or less commonly by injection.

Common adverse effects include nausea and rash. It may also increase the risk of yeast infections and when used in combination with clavulanic acid, diarrhea. It should not be used in those who are allergic to penicillin (Gillies *et al.*, 2016). While usable in those with kidney problems, the dose may worsen severe inflammation of the bronchial tubes lining. It is also used to treat problems during childbirth such as fever caused by a uterine infection during delivery. Reichlox may also treat other infections such as blood and bone infections, ear, nose and throat infections. It is a prescription medicine. This medicine contains Ampicillin and Cloxacillin, both damage the bacteria by acting on the bacterial cell wall formation. Reichlox is also used to prevent and treat bacterial infections in the premature or newborn child. It is used to treat wound and respiratory system infections after an operation (Stocker, 2015).

An active ingredient is any component that provides biologically active or other direct effect in the diagnosis, cure, mitigation, treatment or prevention of disease or to effect the structure or any function of the body or humans or animals (Lee, 2009). The similar term active pharmaceutical ingredient. The traditional for the active pharmaceutical agent is *pharmacon* or *pharmakon* which originally denoted a magical substance or drug.

The term active constituent or active principle are often chosen when referring to the active substance of interest in a plant (such as Salicylic acid in willow bark arecine in areca nuts) because the word “ingredients” in many minds connotes a sense of human agency (that is something that a person combines with other substances) Whereas the neutral product presents in plant where not added by any human agency but rather occurred naturally (a plant doesn’t have ingredients)

In contrast with active ingredients, the inactive ingredients are usually called excipients in pharmaceutical contexts. The main excipient that seems as a medium, for conveying the active is usually called the vehicles. The term “inactive” should not be misconstrued as meaning inert. The dosage form for a pharmaceutical contain the active pharmaceutical ingredient which is the drug substance itself and excipients which are the ingredients of the tablet or the liquid in which the agent is suspended, or other materials that is pharmaceutically inert. Drugs are chosen primarily for their active ingredients. During formulation development, the excipients are chosen carefully so that the active ingredients can reach the target site in the body at the desired rate and extent.

Patient often have difficulty in identifying the active ingredient in their medication and are often unaware of the notion of an active ingredient. When patients are on multiple medications, active ingredients can interfere with each other, often resulting in severe or life threatening complication. There are now online services which can identify the active ingredients of most medication such as the medicine database providing information on medication available in Australia (Michael, 2002).

Ampiclox capsule contains Ampicillin and Cloxacillin as active substances. Both Ampicillin and Cloxacillin bind to certain proteins called penicillin binding proteinse (PBPs) and prevent the formation of the bacterial cell wall. The following are the brands of Ampiclox and their active ingredients:

Ampiclox (Beecham) is a mixture of Ampicillin and Cloxacillin for infections during the first weeks of life. It is available in conveniently small doses as oral drops or as an injection. Beecham Ampiclox belongs to the group of antibiotics called 'penicillin' used to treat a wide range of bacterial infections. It is a 'broad-spectrum antibiotic' which treats various bacterial infections of the ear, nose, throat, bones, lungs, and post-operative wound infections. Bacterial infections are caused due to the multiplication of harmful bacteria inside or on the body. These harmful bacteria produce chemicals known as toxins, which can damage tissue and make you sick. It contains two penicillin antibiotics namely: Ampicillin and Cloxacillin. Beecham Ampiclox works by preventing the formation of bacterial cell covering, which is necessary for their survival. Thereby, kills the bacteria and helps in treating and preventing the spread of infections. Ampiclox does not work against infections caused by the virus, including cold and flu (Batchelor *et al.*, 2019).

Reichlox belongs to a class of medicines called Antibacterials. Antibacterials, also known as Antibiotics, are widely used in the treatment and prevention of diseases called by bacteria. It destroys or slows down the growth of bacteria. Reichlox Capsule is used to treat certain infections including, respiratory infections such as pneumonia with inflammation in the bronchi and worsen severe inflammation of the bronchial tubes lining. It is also used to treat problems during childbirth such as fever caused by a uterine infection during delivery. Reichlox may also treat other infections such as blood and bone infections, ear, nose and throat infections. It is a prescription medicine. This medicine contains Ampicillin and Cloxacillin, both damage the bacteria by acting on the bacterial cell wall formation. Reichlox is also used to prevent and treat bacterial infections in the premature or newborn child. It is also used to treat wound and respiratory system infections after an operation (Stocker, 2015).

Vadisclox is a prescription medicine that belongs to a class of medicines called Antibacterials. Antibacterials, also known as Antibiotics are widely used in the treatment and prevention of diseases caused by bacterial. It destroys or slows down the growth of bacteria. Vadisclox Capsule is used to treat certain infections including, respiratory infections such as pneumonia with inflammation in the bronchi and worsen severe inflammation of the bronchial tubes lining. It is also used to treat problems during childbirth such as fever caused by a uterine infection during delivery. Vadisclox may also treat other infections such as blood and bone infections, ear, nose and throat infections. This medicine contains Ampicillin and Cloxacillin, both damage the bacteria by acting on the bacterial cell wall formation. Vadisclox is also used to prevent and treat bacterial infections in the premature or newborn child, and to treat wound and respiratory system infections after an operation (Tedlow *et al.*, 2014).

Amoxicillin is an antibiotic. The active ingredient is Amoxicillin. This belongs to a group of medicines called 'penicillins'. The following are the brands of Amoxicillin and their active ingredients.

GSK (GlaxoSmithKline): It contains both Amoxicillin and Clavulanate potassium chemical composition Amoxicillin and Clavulanate potassium chemical compound in various strengths and substitutes.

Noxil belongs to a class of medicines called Penicillin-class Antibacterial. Penicillin are a group of antibiotics that are used to treat and prevent different type of bacterial infections.

Noxil Capsule is used to treat certain bacterial infections. These include bacterial infections of the ear, nose, or throat, reproductive tract infections or urinary system infections such as UTI, and skin or respiratory system infections including pneumonia. Noxil is also used to treat bacterial infections in other parts of the body including in teeth from a dental abscess, in the joints, in the blood or heart, and bacterial infections in the brain or the spinal cord caused by bacterial meningitis. Noxil is also used to treat tick-borne bacterial infections, also called as, Lyme disease. It is a prescription medicine. This medicine works by preventing growth of bacteria in the body.

Noxil Capsule may also be taken in combination with other medicines to treat certain conditions as recommended by the doctor. Noxil Capsule is used together with Clarithromycin, or Lansoprazole to treat infections caused by bacteria (*Helicobacter pylori*) and duodenal ulcer disease. This combination is used to reduce bacterial resistance and to maintain the effectiveness of Noxil. Noxil is also used alone with lansoprazole if the patient cannot use clarithromycin

(<https://www.tabletwise.net/nigeria/noxil-capsule>).

Vamoxil is a prescription medicine that belongs to a class of medicines called Penicillin class Antibacterial. Penicillin are a group of antibiotics that are used to treat and prevent different type of bacterial infections.

Vamoxil Capsule is used to treat certain bacterial infections. These include bacterial infections of the ear, nose, or throat, reproductive tract infections or urinary system infections such as UTI, and skin or respiratory system infections including pneumonia. Vamoxil is also used to treat bacterial infections in other parts of the body including in teeth from a dental abscess, in the joints, in the blood or heart, and bacterial infections in the brain or the spinal cord caused by bacterial meningitis. Vamoxil is also used to treat tick-borne bacterial infections, also called as, Lyme disease. This medicine works by preventing growth of bacteria in the body.

Vamoxil Capsule may also be used together with other medicines to treat certain conditions as recommended by the doctor. It is used in combination with Clarithromycin, or Lansoprazole treat infections caused by bacteria (*Helicobacter pylori*) and duodenal ulcer disease. This combination is used to reduce bacterial resistance and to maintain the effectiveness of Vamoxil. Vamoxil is also used alone with lansoprazole in the patient cannot use clarithromycin (<https://www.tabletwise.net.nigeria/Vamoxil-capsule>).

2.0 MATERIALS AND METHODS

2.1 Sample Collection

Samples of Ampiclox antibiotics such as Becham, Reiclox and Vadisclox and samples of Amoxicillin antibiotic, such as vamoxil, Noxil and GSK were purchased from paragon pharmacy in Oko, Orumba North Local Government area of Anambra, Nigeria. The samples were taken to the laboratory for further analysis.

2.2 Determination of Essential Components in Antibiotics

UV visible spectrophotometric method is one of the most commonly that was used in analytical methods for the quantification and qualification analysis of Ampiclox and Amoxicillin antibiotics.

2.2.1 Qualitative Analysis of Amoxicillin and Ampicillin

This method is a UV-Visible spectrophotometric method for the determination of amoxicillin was developed by modifying the method 0.1N NaOH was used as a solvent. In this study, by using 0.1N NaOH the absorbance was taken. The developed method was based on the formation of an ion-pair complex between amoxicillin and bromocresol green in 0.1N NaOH. The change to blue coloration was observed indicating the presence of amoxicillin/ampicillin.

2.2.2 Quantification of Amoxicillin and Ampicillin

Standard solutions of amoxicillin and ampicillin of 20ug/ml, 40ug/ml, 80ug/ml and 100ug/ml was prepared in 0.1N NaOH solution and their absorbance reading taken at 247nm. Calibration curve of the standard drugs was plotted and regression equation generated. Three capsule each of the different brands of the average weight was taken. 500ug/ml of the sample was prepared in the solution of 0.1N NaOH, filtered and the absorbance reading was taken at 247N, the concentration curve regression equation.

3.0 RESULTS AND DISCUSSION

3.1 Results

The result of the absorbance of Ampiclox and Amoxicillin samples tested are presented in tables below

Table 1: Absorbance of Ampiclox and Amoxicillin samples

Samples	Absorbance of sample	Absorbance of blank	Real absorbance
Ampiclox			
Beecham	0.096	0.094	0.002
Reichlox	0.104	0.094	0.010
Vadisclor	0.154	0.094	0.060
Amoxicillin			
Vamoxil	0.5501	0.094	0.4561
Noxil	0.5521	0.094	0.4581
GSK	0.5521	0.094	0.4581

Table 2: Quantitative Analysis of Ampiclox and Amoxicillin Samples

Sample	Label Claim	Experimental Value
Ampiclox		
Beecham	500mg	682mg
Reichlox	500mg	690mg
Vadisclor	500mg	740mg
Amoxicillin		
Vamoxil	500mg	461mg

Noxil	500mg	463mg
GSK	500mg	463mg

3.2 Discussion

The result of the experiment carried out on the absorbance of the antibiotic samples presented in table 1 shows that the absorbance of the Ampiclox samples ranges from 0.002 to 0.060 while that of Amoxicillin samples were from 0.4561 to 0.4581. This shows that there were no significant differences between the absorbance ability of the antibiotic sample studied. The result of the quantitative analysis presented on table two shows that the label claim of the studied samples was 500mg however there were significant differences from this quantity and the quantity obtained from the experiment. The experiment shows that the experimental values of the samples for Ampiclox are 682mg for Beecham, 690mg for Reichlox and 740mg for vadiclox while for Amoxicillin are 461mg for Vamoxil, 463mg for Noxil and 463mg for GSK. The result obtained shows that the quantity obtained for the Ampiclox samples were higher than the label claim of 500mg while the quantity obtained for the Amoxicillin samples were lower than the label claim of 500mg.

Antibiotics are a group of chemical produced by microorganisms and commercially produced synthetically or semi-synthetically. Because of the wide spread use and therapeutically significance of these drugs on the one hand and the fact that the efficacy of a drug depends largely upon the purity of the active ingredient and the excipients, on the other hand, and also the fact that these medicines and their active ingredients used in this research are purchased and imported from various countries around the world; obviously their qualities may be different from one another to some extent and therefore must be checked regularly.

4.0 CONCLUSION AND RECOMMENDATION

4.1 Conclusion

The experiment on the comparative quantitative analysis of the active ingredients in Ampiclox and Amoxicillin was successfully carried out and the results presented accordingly. The use of antibiotics, especially at the basic level, needs to be monitored to avoid problems related to its use at the next level of treatment. Findings revealed that the health offices have established a policy to control its use. This policy is good for preventing the irrational use of antibiotics which could ultimately lead to its resistance.

4.2 Recommendation

Due to time and financial constraints, the researcher was unable to dive deep into the study, therefore it is suggested that:

More studies should be carried out on this topic to cover the areas the researcher might have missed due to factors beyond their control as at the period of conducting this experiment.

Investigating and determining the purity of the standard active ingredients imported from abroad should be strictly carried out as this affects the quality of drugs produced with them.

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