

## DETERMINATION OF QUALITY DETERIORATION OF HYPERTENSIVE DRUG USING PHYSICAL PARAMETERS

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### ABSTRACT

*The electrical conductivity and pH of expired and non-expired hypertensive drugs were investigated. Two samples each of the expired and non-expired drugs were examined using conductivity meter (Kalinipkan) and pH meter (Corning 425). Out of the two samples measured, the non-expired Exforge HCT was observed to have the highest conductivity value of 620.00  $\mu\text{S}/\text{cm}$  and expired Twynsta with the lowest conductivity value of 410.00  $\mu\text{S}/\text{cm}$ . The high conductivity drug shows its measure of ionic concentration and activity. Also, the expired Exforge HCT had the highest pH of 7.25 and non-expired Twynsta had the lowest pH of 7.10. The measured pH value are not too far from the pH of a normal human biological system which lies in the range of 7.30 – 7.45. The result of this work shows that the pH values of the expired drugs are higher than those of the non-expired drugs. Similarly, the conductivity value of the non-expired drugs are higher than those of expired drugs; hence the conductivity and pH parameters can be used to characterized and monitor the quality of hypertensive drugs with the view of detecting quality deterioration and adulteration of the drugs.*

**Keywords:** *Electrical conductivity, pH, expired drugs, non- expired drugs.*

### INTRODUCTION

A drug is any substance (other than food that provides nutritional support) that when inhaled, injected, smoked consumed, absorbed via a patch on the skin, or dissolved under the tongue causes a temporary physiological and often psychological change in the body (Drug Dictionary.com Unabridged 2007). In pharmacology drug, also called a medication or medicine, is a chemical substance use to treat, cure, prevent or diagnose a disease or to promote well-being. Traditionally drugs were obtained through extraction from medical plant, but more recently also by organic synthesis (Atanasov *et al.*, 2015). Pharmaceutical drugs may be used for a limited duration, or on a regular basis for chronic disorders (American Heritage Science Dictionary, 2007). Pharmaceutical drugs are often classified into drug classes groups of related drugs that have similar chemical structures, the same mechanism of action binding to the same biological target, a related mode of action, and that are used to treat disease (Mahoney *et al.*, 2008). The anatomical therapeutic chemical classification system (ATC), the most widely used drug classification system assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drugs classes with ATC system.

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Another major classification system is the biopharmaceutics classification system. This classifies drugs according to their solubility and permeability or absorption properties (Bergstorm *et al.*, 2014). Psychoactive drugs are chemical substance that affects the function of the central nervous system, altering perception mode or consciousness. They include alcohol, a depressant and a stimulant in small quantity and the stimulants nicotine and caffeine. These three are the most widely consumed psychoactive drugs worldwide (Crocq, 2013). And are also considered recreational drugs since there are used for pleasure rather than medicinal purposes (Drug Dictionary.com 2007). Other recreational drugs include hallucinogens, opiates and amphetamines and some of these are also used in spiritual or religious settings. Some drugs can cause addiction. Excessive use of stimulants can promote stimulant psychosis. Many recreational drugs are illicit and international treaties such as the single convention on Narcotic Drugs exist for the purpose of their prohibition. The aim of this research work is to determine the quality deterioration of hypertensive drugs using physical parameter

### **MATERIALS AND METHOD**

The drugs sample collected for the purpose of this research work include: Exforge HCL and Twynsta expired and non-expired hypertension drugs were bought from pharmaceutical stores situation in Uyo, Akwa Ibom State.

#### **Determination Of pH**

The pH of samples were measured using a pH meter which generally comprises a detecting unit consisting of a glass electrodes and a reference electrode, and an indicating unit for indicating that pH values corresponding to the electrode motive force detected. The indicating unit usually has dials for zero point adjustment and temperature compensation. They glass electrode were immersed previously in distilled water for an hour.

Then measurement commenced for 10minutes after switching on the detecting units which was properly rinsed with distilled water and allowed for some minute to be thoroughly drained. After measurement were carried out on the three samples; a proper rinsing and draining of the detecting unit was done before commencing on another. The readings for same solution were repeated and average value taken.

#### **Determination of Electrical Conductivity**

The electrical conductivity meter called kalanikpan was used. The electrode was rinsed with distilled water immersed in the sample. The conductivity knobs were pressed and the reading on the meter was allowed to set, then the values on the instrument was taken and recorded in us/cm. The experiment was repeated two time using solution after which the average value was taken. The conductivity

value was read and recorded. The experiment was carried out for all three samples and the reading recorded accordingly.

## RESULTS AND DISCUSSION

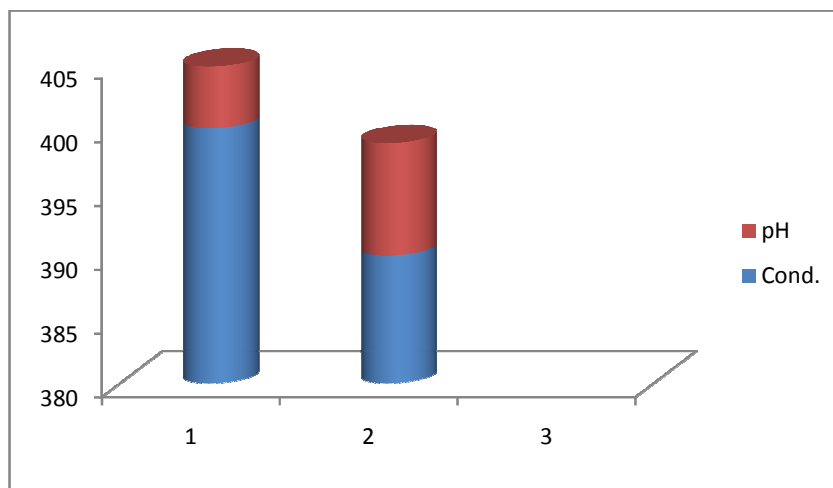
The results obtained for electrical conductivity and pH of non-expired and expired drugs are shown in tables 1 and 2 respectively. A graphical representation of the conductivity and pH of expired and non-expired drugs sample is shown in figures 1 and 2 respectively.

**Table 1: Conductivity and pH of non-expired drugs**

Sample Code	Drug Samples	Conductivity us/cm	Ph
A	Exforge HCT	620.00	7.10
B	Twynsta	410.00	7.25

**Table 2: Conductivity and pH of expired drugs**

Sample Code	Drug Samples	Conductivity us/cm	pH
A	Exforge HCT	400.00	4.83
B	Twynsta	390.00	8.83



**Fig. 1: pH of expired drugs.**

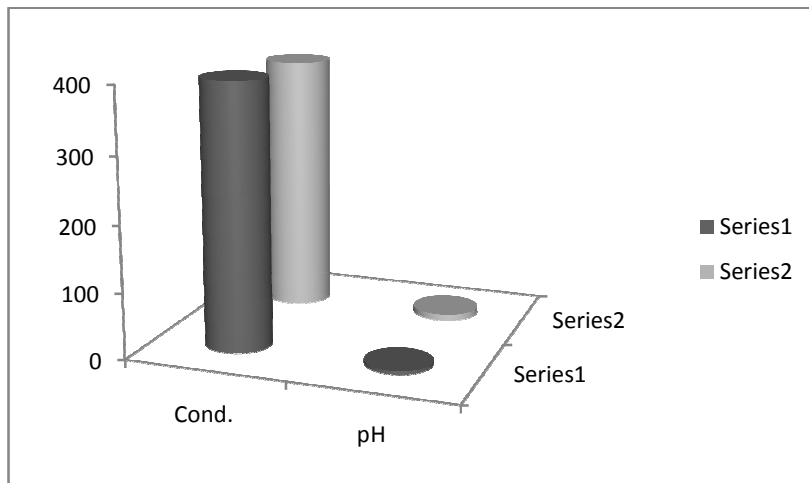


Fig. 2: pH of non-expired drugs.

## DISCUSSION

From table 1 and fig.1, the non-expired Exforge HCT and Twynsta drugs has a high conductivity of  $620.00 \mu\text{s}/\text{cm}$  and  $410.00 \mu\text{s}/\text{cm}$  while expired Exforge HCT and Twynsta drugs has a lower conductivity value of  $400.00 \mu\text{s}/\text{cm}$  and  $390.00 \mu\text{s}/\text{cm}$  respectively. The high conductivity value of non- expired drugs shows the high number of ions available in the conduction process of assimilation by the fluids while the low conductivity value from the expired drugs Exforge HCT and Twynsta shows that it will take enough time to work in the body cells, therefore; the alimnt fluctuate the symptoms for which it was prescribed and will require serious medical attention to correct. It was also observed that the non-expired Exforge HCT drug has a higher conductivity of  $620.00 \mu\text{s}/\text{cm}$  than the expired Exforge HCT which has a value of  $400.00 \mu\text{s}/\text{cm}$ , thus the conduction of charge ions in body fluids is also enhanced. Non-expired Exforge HCT drugd has a higher conductivity in the plot of conductivity against expired drugs because of its high penetration ability and easy absorption of body cells. The lower conductivity of the expired drugs could likely be as a result of their chemical integrity. The low conductivity reduces the rate of penetration ability, hence delaying the healing effect.

From table 2 and fig. 2, expired Exforge HCT has a higher pH of 8.83 than non-expired Exforge HCT with a value of 7.10. Both pH values are greater than the range of 7.30 to 7.45 for a normal body pH. Thus, they are alkaline. Since the expired Exforge HCT is extremely high with a value of 8.83, assimilation of the drug in the body can result to alkalosis which accompany with symptoms like convulsion, hand tremor, light headiness, muscle twitching, vomiting and numbness. The expired Twynsta is observed to have a lower pH of 4. 82 while the non-expired Twynsta has a higher pH 7.25. The normal pH of the human body is around 7.30 to 7.45. When the pH is higher than this, it result in decreased

bodily function; process such as protein synthesis and mineral assimilation and many others. When the pH gets outside the optimal range, these processes can slow down drastically or can stop completely. A higher pH signified greater alkalinity and low pH signifies acidity. When the acidity level is high it cannot imbalanced pH and can be correlated to health issues, such as, heart ailments and cancers.

## CONCLUSION

Non-expired Exforge HCT drugd has a higher conductivity in the plot of conductivity against expired drugs because of its high penetration ability and easy absorption of body cells. The lower conductivity of the expired drugs could likely be as a result of their chemical integrity. This research work has shown that, electrical conductivity and pH of drugs can be used as a parameter to characterized and monitor the quality of drugs especially hypertensive drugs with view of detecting expired samples and to create awareness in detecting quality deterioration of the body, hence it is recommended that the conductivity value of non-expired drugs are higher than those of expired drugs; hence the conductivity and pH parameters can be used to characterized and monitor the quality of hypertensive drugs with the view of detecting quality deterioration and adulteration of the drugs.

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