A Novel Treatment of Antibiotic Effluent pollution From Abattoirs In Mosul City

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Abstract

Beta-lactam substances released into the environment by continuous using via human, animal and plant protection from bacterial infection. These of antibiotic presence has considered very dangerous problem of the public health in general throughout many side effects. Also, the prevalence of antibiotics into the wastewater abattoirs leads to environmental hazard as results of remains into the surrounding and difficulty disposal. In this study, the research have focused on how to elimination of antibiotic from wastewater abattoirs (animal slaughtered sources), in particular, subunits of wastewater stations have not ability to trapping these kinds of substances. Chemical pathways have used to interact directly with Beta-lactam group and convey to the chemical complex and easy to completely removal from wastewater discharged by using Copper sulfate salts. Our results found that using four molecules of CuSo4 for one molecule of Beta-lactam, in order to complete removal process and possibility reusing it at the same time almost 300% percentage. Also, for increase the reaction process, it is recommended to use optimal a temperature between 40-60 ° C. Overall, we need strict laws to limit the spread of antibiotic contamination in the nature as a results of harmful and side effects on all creatures.

Keywords: Public health, Antibiotic residue, Chemical treatment, Abattoir.

1. Introduction

The presence of antibiotics in our environment are a real problem, by their negative effects on the public health [1]. Antimicrobial is a chemical compounds substances and persisting into the surroundings leads to risk implication, in particular, recently increasing consumption ratio by human, animal and plant [2-4]. The continuous using antibiotics have caused the acquisition of bacterial resistance genes, inhibition bacteria normal flora proliferation and remaining within the body tissue, causing toxicity as a result of accumulation [5-7]. Usually, the animal diseases (bacterial causes) have treated with different types of antibiotics [8]. Even though the antibiotics cure animal illness, but there are many side effects still existent after therapy, such as antibiotic shedding from animal body 7-14 days from urine and milk, antibiotic residue within carcasses and throughout washing carcasses post-slaughtered into the abattoir, also, contamination slaughterhouse utensils with it [9]. Additional, there is a real problem into the wastewater plants into the abattoirs, because these stations lack specialized units to remove antibiotics from effluent, and continues contamination environment around [10]. Therefore, the main reasons to develop a highly efficient techniques in order to removal these kinds of substance for achieve the standards of drainage and safe disposal of water that coming out by being add a new unite for wastewater treatment plants. In this study, a new chemical reaction pathway will be used to trap and eradicate antibiotic (beta-lactam group) from abattoirs effluent water discharge.

2. Material and Methods

2.1. Reagents

The reagent substance was prepared is Copper sulfate (1M solution), by dissolved 24.96 gram per 100 ml H2O according to Chem-Lab company manufacture. In contrast, the standard solution of antibiotic (beta-lactam group) was prepared 1000ppm by dissolving 1gram of pure powdered into the 1 ml distilled water [11]. Also, buffer solution was used at pH=7.7 based on the alkaline chemical pathway of the reaction compound.

2.2. Procedure

The standard solution was placed same volume 1ml each container. During that, the volume of reagent was added 1ml, while the buffer solution was added different solution starting 1ml, 2ml, 3ml, 4ml and 5ml, and completed each reaction by added
distilled-water until reach 25 ml of volume within the volumetric flask. Then, the absorbance was measured by Spectrophotometer (721-visible Zenith Lab Co.LTD) at 450 nm, by comparison with the Blank solution (Reagent and buffer solutions only) [12]. With consideration of measured each reaction by difference time and temperature (figure 1).

Figure 1. Step by step for the chemical analysis of standard solution (Beta-Lactam) during interact with Reagent and measuring the absorbance by Spectrophotometer at 450 nm in different times and temperatures.

3. Results

The Standard solutions (Beta-lactam) are interact with Reagent directly under alkaline circumstances, (buffer solution was pH=7.7). The absorbance ratios shows increased progressive linear, based on the different of concentrations of buffer solution (figure 2).

Figure 2. Direct determination of chemical reactions of Beta-lactam with CuSo4 by different volumes of buffer solution starting from (1-5 ml) compared with blank solution, at absorbance 450 nm. Notably, the experiment has been triplicate repeated.

In contrast, the chemical interaction of beta-lactam with CuSo4 was increased during times effect at (5, 15, 30 and 60 min). The result was indicated a variable by increasing color profundity, at absorbance 450 nm (table1).

Table 1. The effect different times for the increasing the absorbance ratio of chemical reaction between beta-lactam and CuSo4 by different volumes of buffer solution from 1-5 ml at pH=7 compared to Blank solution. Notably, the experiment has been triplicate repeated.

| Vol. | Blank | 1 ml | 2 ml | 3 ml | 4 ml | 5 ml |
|------|-------|------|------|------|------|------|
| 5 min| 0.012 | 0.064| 0.087| 0.239| 0.240667| 0.354667|
| 15 min| 0.012| 0.1485| 0.286333| 0.333| 0.421333| 0.427333|
| 30 min| 0.012| 0.429667| 0.436667| 0.46| 0.492333| 0.495|
| 60 min| 0.012| 0.45 | 0.47 | 0.509667| 0.531333| 0.560667|
On the other hands, the difference degrees of temperature effects have been increased chemical interaction between beta-lactam and CuSO₄ with different volumes of Buffer solution at absorbance 450 nm. The results were variable moderate raised at (10.4, 25, 30 °C). While, there were marked increase of chemical reaction at 40 and 50 °C (table2).

**Table 2.** The effect different heats for the increasing the absorbance ratio of chemical reaction between beta-lactam and CuSO₄ by different volumes of buffer solution from 1-5 ml at pH=7 compared to Blank solution at temperatures10.4, 25, 30, 40 and 60 °C Blank solution. Notably, the experiment has been triplicate repeated.

| Vol. | Temp. | Blank | 1 ml  | 2 ml  | 3 ml  | 4 ml  | 5 ml  |
|------|-------|-------|-------|-------|-------|-------|-------|
| 10.4 °C | 0.006 | 0.097333 | 0.105 | 0.136667 | 0.145 | 0.148 |
| 25 °C  | 0.04  | 0.154333 | 0.163 | 0.198667 | 0.276667 | 0.288 |
| 30 °C  | 0.042 | 0.281   | 0.300333 | 0.352667 | 0.367 | 0.601 |
| 40 °C  | 0.06  | 0.378   | 0.94  | 1.030667 | 1.167333 | 1.727 |
| 50 °C  | 0.065 | 0.386333 | 1.071 | 1.437667 | 1.568667 | 2.239333 |

Stoichiometry of chemical reaction for Beta-lactam and Copper sulfate was revealed at pH=7.7 by mole ratio technique. The amounts molecules indicated the presence of 4:1 of Beta-lactam and CuSO₄ ratio. Therefore, the structure proposed to the colorimetric of interaction was indigo and could be written as figure 3.

**Figure 3.** The final stoichiometry chemical molecule of interaction between Beta-lactam and copper sulfate at ratio 4:1 and the final color is indigo as the indication of stop reaction.

**Discussion**
The target of research has finding a new precise and cheapest technique to eradicate antibiotic contamination wastewater discharge of abattoirs in Mosul city, because all Mosul’s abattoirs wastewater plants missing these kinds of subunits based on previously studies results [9]. The safest method was used a Copper sulfate salt by interacted directly with antibiotic (beta-lactam group) and create compound. The results finding, directly interaction of four molecules of antibiotic (pure of Beta-lactam) with one molecule of Copper sulfate salts depend upon stoichiometry. Also, our finding that the time of chemical reaction at 60 min not effective enough compared to 5 min of reaction was almost 37%. In contrast, increasing different temperature in particular at 40 and 50 °C was more than 300% compared to room temperature.

Previous studies were used other ways to eradicate Beta-lactam pollution from wastewater, but it was useless and more expensive compared to our finding [13-16]. Overall, it is a need to innovate and making many studies that include the search for cheap and a new methods and materials to influence the cost of antibiotic removal. Our finding and strongly recommend the owners of abattoirs and should be followed by adding a new unit for their wastewater stations by using Copper-sulfate salts in order to fully removal of antibiotic substances through trapping and settle down each beta-lactam molecule from wastewater disposal outside of their abattoirs.

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