Estimation of the Biological Activity of Some Commercial Bleaching Solutions (Hypochlorites) on Pathogenic Bacteria

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Abstract

Hypochlorites, the active ingredients in bleach, are an extremely useful chemical that have been used since the 18th century as a disinfectant.Hypochlorite solutions are in general strong oxidizing agents. The study included of five species of hypochlorite solutions widely used as commercial bleaching solutions (*Shoof*, *Oroplus*, *Alwazir* , *Lamoa* and *Fas)* and their concentrations were confirmed chemically by potentiometric titration methods previously and applicate their ability and efficiency against two types of bacteria (*E.coli and Staphylococcus arueus*) which are isolated from human infected sample in general Heat hospital /Iraq. The results revealed that all bleaching solutions have anti-bacterial influence against two species of bacteria and more successful against *Staphylococcus aureus* than the *E.coli* especially with *Alwazir* solution give high significant difference compared with other solutions ,also the outcomes showed sensitivity of bacteria enhanced with concentrations of bleaching solutions. The study indicates the fast reduction rate in the 30S reaction showed the immediate efficiency of Hypochlorites. Finally the current study suggest and encourage to use hypochlorite solutions as antiseptics and disinfectants to killing species of bacteria which proved their efficiency during this study.

Keywords: *Bleaching solutions, E.coli and Staphylococcus arueus, Antimicrobial, Microorganism, Hypochlorite's.*

Introduction

Hypochlorites are in general strong oxidizing agents. Commercially, they are used as an alternative to chlorine gas for chlorination of domestic water supplies and swimming pools [1]. They were used also in cooling towers of air conditioners and power stations to control bio fouling [2].Acidified sodium chlorite was used an alternative to chlorine in reducing microbial populations to maintain food quality and safety on fresh –cut produce [3]. Commercial acidified sodium chlorite and sodium hypochlorite exhibited strong efficiency on reduction of microorganisms including *E.Coli* [4].(Estrela et al) have studied the mechanism of action of sodium hypochlorite on the activity of some types of bacteria. They found that the chloramination reaction between chlorine and amino group (NH) forms chloramines that interfere in cell metabolism [5].

Sodium hypochlorite, the active ingredient in bleach, is an extremely useful chemical that has been used since the 18th century as a disinfectant [6]. In the circulation, NaOCl combines with water to generate hypochlorus acid (HOCl) conferring potent anti-bacterial and antifungal properties [7]. Some factors affecting the concentration of available chlorine in commercial sources of sodium hypochlorite were studied by (Frias *et al*) [8].The effect of storage temperature and heating on the concentration of available chlorine and pH of 2.5 % NaOCl were investigated and found that storing NaOCl at 4ºC is optimal for longer shelf life and pH of the samples did not affect the stability of NaOCl in this study [9]. Preheating NaOCl solutions appears to improve

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their nectrotic pulp tissue dissolution capacity and efficacy against stationary phase of E. faecalis cells [10]. Studies were conducted to compare the effect of sodium hypochlorite (SH) versus mono chloramine (MON) on bacterial populations, these studies indicated that (MON) is superior to SH in reducing microbial populations in poultry chiller water [11]. Antimicrobial activity of several concentrations of sodium hypochlorite and chlorhexidine gluconate in the elimination of E.faecalis were studied, the study confirmed the antimicrobial activity of chlorhexdine and sodium hypochlorite [12]. Other study concluded that heating the solutions have enhanced their ability to dissolve organic material [13].

Materials and Methods

Preparation of commercial bleaching solutions

Commercial bleaching solutions are mostly sold in the commercial market in Iraq from different companies such as: *Shoof, Oroplus*, *Alwazir*, *Lamoa* and *Fas* showed in **table 1**. Their concentrations were confirmed chemically by potentiometric titration methods before application them against bacteria [14].The percentages of each solution was converted to milligram units per milliliter. The solutions were then ready to conduct the biological activity of two pathogenic bacteria, namely: *E.Coli* and *Staph aureus*.

Table (1): Species of commercial bleaching solutions (hypochlorites) used in this research.

Name of company	Source	Concentration
Shoof	Iraq	40 mg/ml
Oroplus	Turkey	50 mg/ml
Alwazir	Jordon	30mg/ml
Lamoa	Iraq	25 mg/ml
Fas	Iraq	50 mg/ml

Culture media:

They were prepared in accordance with the guidance of the manufacturers and sterilized under pressure of 12-15 PSI in autoclaves for 24 hours at 37 ° C. They were then sterilized. Then used for bacteria analysis culture and diagnosis.

Culture preparation:

Bacteria were regenerated and kept in the incubator for 24 hours at an average temperature of 37 ° C. Then they were applied to sterilized tubes with heart infusion broth and put into the incubator at 37 ° C for 24 to 72 hours. The chances of a mild transmission were 27 percent at a wavelength of 580 nanometer and a 100 percent light transmission for the nutrient bread that was used to arrange the micro-organism. Total bacteria are counted as number predicted with the assistance of a spectrophotometer.

Results and Discussion

In this study, the results demonstrated that the all types of commercial bleaching solutions (hypochlorites) have anti-bacterial influence against two species of bacteria (*Staph. aureus* and *E.coli*), and the sensitivity of types bacteria were gradually increased with increasing of bleaching solutions concentrations exception of (*Oroplus* 50mg/ml) in *E.Coli gives* little sensitivity about the concentration that has before (*shoof* 40mg/dl)(Table.2).Previous study demonstrated that investigation in vitro the antimicrobial activity of sodium hypochlorite NaOCl at different concentrations can be used as irrigating solutions owing to their antimicrobial

properties [15].

In this research, E. coli and Staphylococcus aureus isolates displayed resistance to hypochlorite solutions [16] recorded that bacteria completely isolated from contaminated disinfectant solutions and antiseptics display increased resistance to widely used antibiotics, provided that bacteria have the ability to share strong markers and, as resistance arises for one agent, cross-resistance.

The result in (fig1, 2 and table.2) explained that the hypochlorites have been more successful against *Staphylococcus aureus* than the *E.coli* confirmed with this finding [17] especially with *Alwazir* solution as it gave the high significant efficiency compared with other solutions. The outcomes are agreement with other studies which are indicate that Gram's negative bacteria are less sensitive to antiseptics and disinfectants. The final result was accepted [18], whereby the complicated cell layer, and their outer membrane functions as a permeability shield for restricting or blocking entry of different chemicals [19] .

The fast reduction rate in the 30S reaction showed the immediate efficiency of Hypochlorites [20]. The oxidizing mechanism can explain the immediate killing of bleach [21] .The bleach became bactericidal for vegetative species quickly, which noticed identical tests. After five minutes of exposure to this disinfectant, the 10% bleach concentration kills all tested bacteria. This contributes primarily to the bleach sterilization mechanism triggered by the oxidation reactions when bleach is mixed with water which lead organisms to be totally destroyed. In addition, four blanching results of the two study bacteria (E. coli and Pseudomonas aeruginosa) was (Fas 50 percent Oroplus 50 % Shoof 40 % Alwazuir 30% Lamaoa 25 % respectively) For both the two bacteria studied (E.coli and Staphylococcus arueus) the efficacy of culturing pattern was specific and from the analysis Fas 50 % and Oroplus50 % had the strongest efficacy against the bacteria studied following by Shoof 40 % Alwazir 30 % Lamoa 25 % had less efficacy against the bacterial measured [18].Hypochlorite concentrations (mg/ml) inhibition zone (mm) Oroplus, Shoof ,Alwazir and Lamoa concentrations indicate a high efficiency against two bacteria studied used in this research, and findings obtained have been confirmed with (Gaonkar *et al*.,2006) [22] .

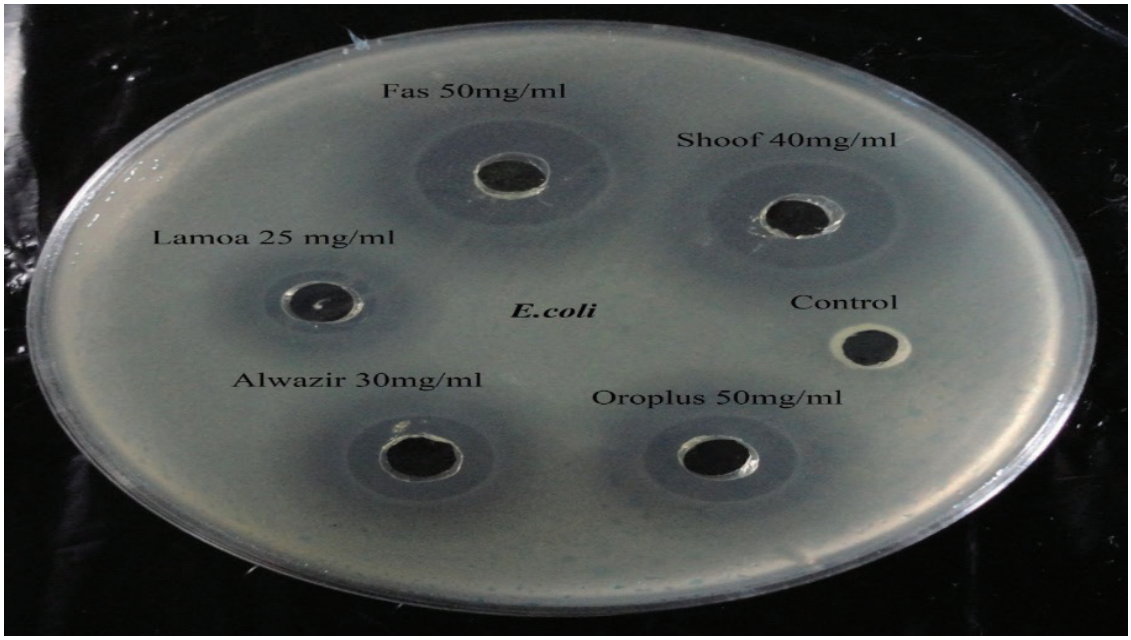

Fig (1): The effect of bleaching solutions on E.coli bacteria

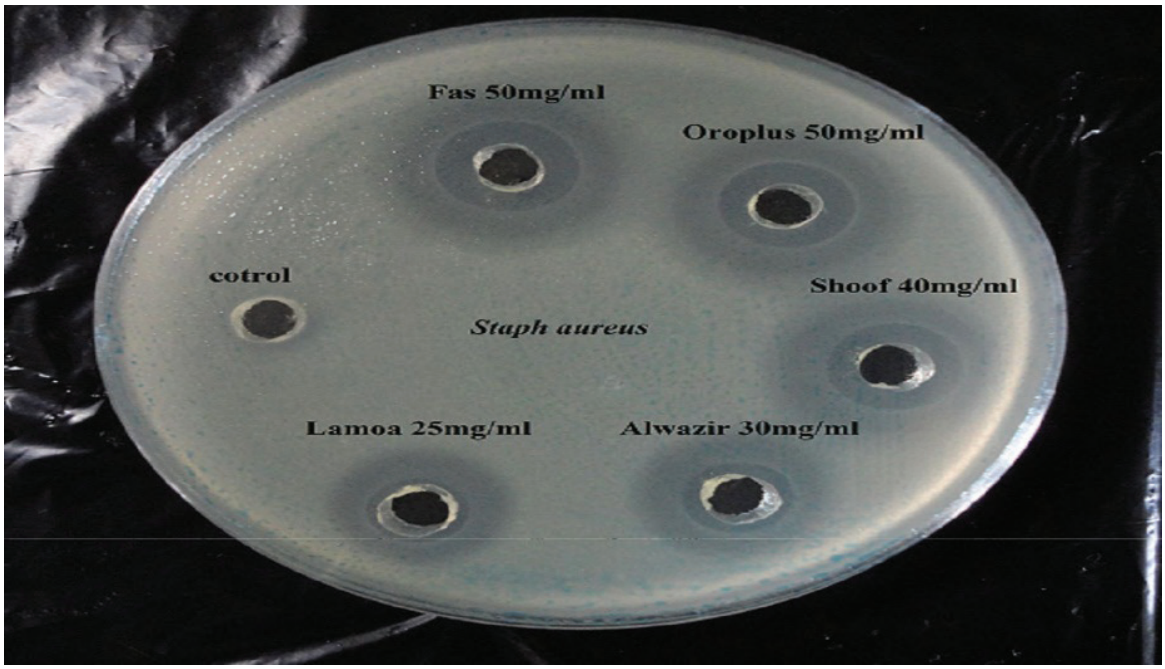

Fig (2): The effect of bleaching solutions on *Staph aureus* bacteria

Table (2): Zone of inhibitions for different concentration bleaching solutions on *E.Coli* and *Staph aureus* bacteria.

Con.(mg/ml) / Zone of inhibition (mm)	Fas 50	Oroplus 50	Shoof 40	Alwazir 30	Lamoa 25	Control D.W
E.coli	22	17	19	12	9	0
Staph aureus	23	21	20	17	12	0

Concluction

Hypochlorite solutions are strong oxidizing agents, extremely useful chemical used as a disinfectant. The study included five species of hypochlorite solutions widely used as commercial bleaching solutions (*Shoof*, *Oroplus*, *Alwazir* , *Lamoa* and *Fas)* and checked their efficiency on bacteria (*E.coli and Staph. Aureus*). All types of commercial bleaching solutions (hypochlorites) have anti-bacterial influence against two species of bacteria and bacterial sensitivity was progressively increased with the exception of concentrations of bleaching solution in *Oroplus* 50mg/ml in *E.Coli* which gives little sensitivity about the concentration that has before, the results explained that all the bleaching solutions have been more successful against *Staphylococcus aureus* than the *E.coli* ,and the outcomes enhance in agreement with other studies which are indicated that Gram's negative bacteria are less sensitive to antiseptics and disinfectants. Finally the current study suggested and encouraged to use hypochlorite solutions as antiseptics and disinfectants for killing species of bacteria.

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