Original article:

Comparison the Effectiveness of *Chitosan* Blue Crab Shells with Ciprofloxacin to the Development of *Escherichia coli*

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Abstract

Background: *Escherichia coli* is a normal intestinal flora that has contributions on the normal functioning of human digestion, but it will turn into a pathogen when it is outside the intestinal tract. *E. coli* including family *Enterobacteriaceae*, facultative anaerobic. Characteristics of *E. coli* is a bacteria gram-negative rod-shaped, motile with flagella or nonmotile, fermentation of glucose, and producing gas. *Chitosan* has antimicrobial effect against bacteria. Amine moieties of *chitosan* content positively charged which is very reactive, and have the ability to bind with the cell walls of bacteria are negative charged. Amine cluster also has a free electron pair, so it was able to attract minerals Ca^{2+} in the cell walls of bacteria. **Objective:** to know the comparative effectiveness of *chitosan* on the shell of a small crab attaching with ciprofloxacin antibiotics against the development of the bacteria *E. coli*. **Methods:** this research uses experimental methods. Techniques used in measuring antimicrobial activity is the diffusion disc method. **Results:** the results showed that the average diameter of the inhibitory zones of *chitosan* against *E. coli* in a row with a concentration of 4%, 5%, 6%, 7%, and 8% is 14.22 mm, 11.94 mm, 9.18 mm, 11.19 mm, and 8.76 mm. Whereas the average diameter of the inhibitory zones of ciprofloxacin is 42.31 mm. **Conclusion:** *Chitosan* small crab attaching shells with a concentration of the most effective in inhibiting the development of the bacteria *E. coli* is *chitosan* with concentrations of 4% with the average drag zone amounting to 14,22 mm.

Keywords: *E. coli*, *Chitosan*, Ciprofloxacin

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Introduction

Infection is a cause of increased rates of morbidity and mortalities especially on developing countries such as Indonesia. Infection is an illness to who caused by microbes pathogenic. One of the cause is that bacteria. Bacterium that can caused infectious disease for example *E. coli*¹. *E. coli* is the major cause of infections of the urinary tract (urinary tract infection / UTI) and may also be causes it to be pathogenic infection acute meningitis, pneumonia, intra-abdominal infections, an infection of the enteric, and others. *E. coli* is of flora normal intestinal on a system the digestion of the human that have a contribution to the normal functioning of intestinal but this bacteria will compose turned into pathogenic

iflacks the outside intestinal². Resistance from the *E. coli* against a broad range of an antibiotic has done much of the it has been reported. The results of an research it is stated that bacteria *E. coli* selects for resistant 60 % against amoxicillin, whereas for ciprofloxacin and gentamicin sensitive 100 %³. Ciprofloxacin is a synthetic antibiotics who was among those fluoroquinolone the second generation who come from the better quinolone. The people of the fluoroquinolone so called because even worse because the changes atoms of fluorine on the rings kuinolon⁴. The fluoroquinolone are still recommended as an antibiotic prophylactic infections of the urinary tract because fluoroquinolone having the power of a strong antibacterial especially against *E.*

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coli. But in the near future it has been much it has been reported about of resistance from the the companions of the fluoroquinolone especially ciprofloxacin as prophylactic therapy infections of the urinary tract of the tariffs range from 20 % -30 %⁵. Indonesia produced any type of waste you the shell of a crab, the skin or the head of shrimp, and other marine animals not less than 56.200 metric tons. The waste has it is been proven do contain many chitin, through certain processes of will produce a current of chitosan so that indonesia have a chance to producing chitin and chitosan from the waste has. At the present time, indonesia had yet to often utilized the waste has so that only also from that affect the environment, especially influence against bad smell and pollution of air⁶. *Chitosan* capable of inhibiting microorganisms such as fungi, gram-positive bacteria and gram-negative bacteria because they have of the nature of antimicroba having a cluster of functional amines (-NH₂) which charged positive and very reactive, so that it can be bonded to bacterium cell wall which charged negative and having a structure resembling peptidoglycan the structure authors 90% bacterium cell wall gram-positive. *Chitosan* having the nature of disturbing activity outer membrane gram-negative bacteria⁷.

Methods

The research is experimental research laboratory with the methods post test only control group design.

Sample

Sample used is culture bacteria *Escherichia coli* in a Muller Hinton Agar (MHA) in incubation at a temperature 37°C for 24 hours. For the determination of the sample of the researchers used Federer Formula:

Descriptions:

n = The number of treatment

t = The number of sample

Federer Formula =

$(n-1) (t-1) \geq 15$

$(n-1) (6-1) \geq 15$

$(n-1) (5) \geq 15$

$5n-5 \geq 15$

$5n \geq 20$

$n \geq 4$

Obtained the calculation on the sample of the as many as ≥ 4 to each group. Then to be divided into 4 groups with local as follows :

1. Muller Hinton Agarto be culture bacteria *E. coli* and given *Chitosan* 4% (P1)
2. Muller Hinton Agarto be culture bacteria *E.*

coli and given *Chitosan* 5% (P2)

3. Muller Hinton Agarto be culture bacteria *E. coli* and given *Chitosan* 6% (P3)

4. Muller Hinton Agarto be culture bacteria *E. coli* and given *Chitosan* 7% (P4)

5. Muller Hinton Agarto be culture bacteria *E. coli* and given *Chitosan* 8% (P5)

6. Muller Hinton Agarto be culture bacteria *E. coli* and given Ciprofloxacin (P6)

Total sample acquired at this study is 24 sample with each group will be conducted 4 repetition.

Data Analysis

The data obtained of the study are the primary data was the results of research that is a comparison of the effectiveness of chitosan with antibiotics ciprofloxacin to the development of bacteria *E. coli* by measuring wide clear zone around paper compact discs containing *chitosan* and ciprofloxacin. The results of the study comparison the effectiveness of chitosan with antibiotics ciprofloxacin to the development of bacteria *E. coli* analyzed exclusively on the computer statistics, to compare the effectiveness of that is meaningful from each group test that is the discus ciprofloxacin, and disk containing chitosan by concentration of the 4%, 5%, 6%, 7%, and 8%. Data analysis of analysis descriptive and the hypothesis on the data SPSS of sports, data variable measured from each group variable described in the form of tables and bars. Table provide an illustration of data descriptive mean and standard deviations, while bars provide a comparison zone obstruct *Chitosan* and ciprofloxacin to the development of *E. coli*. And if the data including the statistics parametric, data the normal distribution is undergone a hypothesis with One Way ANOVA. But, if data not normal distribution it will be done transformation of data by the hypothesis uses the Kruskal-Wallis.

Results

In table 1 shows that there are differences zone obstruct of various concentration chitosan .In concentration chitosan 4% repetition 2 obtained an obstruct zone highest 16,04 mm. in concentration chitosan 5% repetition 1 obtained zone obstruct highest which is about 12,64 mm. in concentration chitosan 6% repetition 2 obtained zone obstruct highest about 12,13 mm. in concentration chitosan 7% repetition 2 obtained zone obstruct highest which is about 10,20 mm. in concentration chitosan 8% repetition 4 obtained zone obstruct highest which is about 9,21 mm.

Repeti- tion	The diameter of an obstruct zone the bacteria E. coli (milimeter)					
	The concentration of chitosan					Cipro floxacin
	4%	5%	6%	7%	8%	
1	12,85	12,64	11,00	7,58	8,10	48,19
2	16,04	12,59	12,13	10,20	8,83	38,78
3	12,60	10,71	10,67	8,85	8,93	40,50
4	15,42	11,85	10,98	10,12	9,21	41,78

On the results of the analysis data is collected the average score is an obstruct zone ciprofloxacin 42,31 mm. While value on average zone obstruct chitosan by concentration of the chitosan 4% obtained 14,22 mm. In concentration chitosan 5% the results on average zone obstruct 11,94 mm. in concentration chitosan 6% the results on average zone obstruct 11,19 mm. in concentration chitosan 7% the results on average zone obstruct 9,18 mm. in concentration chitosan 8% the results on average zone obstruct 8.76 mm. The results of the One Way Analysis of Variance obtained the results of the significant 0,001 which indicates that H_0 is rejected ($P < 0.05$), so that H_1 is accepted which means there were differences in an obstruct zone

resulting chitosan 4%, 5%, 6%, 7%, 8%, and ciprofloxacin in constrained the development of bacteria E. coli.

Discussion

The results of the analysis data indicate that due to the difference in significantly between an antibiotic ciprofloxacin with chitosan 4%, 5%, 6 %, 7%, and 8%. In this study, on average zone obstruct chitosan highest is chitosan by concentration of the 4% obtained 14,22 mm are classified as effective. In concentration chitosan 5% obtained on average zone obstruct obtained 11,94 mm are classified as intermediate. In concentration chitosan 6% obtained on average zone obstruct obtained 11,19 mm are classified as intermediate. In concentration chitosan 7% obtained on average zone obstruct obtained 9,18 mm are classified as ineffective. In concentration chitosan 8% obtained on average zone obstruct obtained 8.76 mm are classified as ineffective. The result shows that chitosan can constrained the development of bacteria E. coli in concentration smallest namely concentration chitosan 4% to a zone obstruct highest namely 14,22 mm are classified as sensitive. It is suspected the lower concentration of chitosan solution, the viscosity of the solution is also reduced, So that it can be diffuses into the media to be carried out efficiently⁸⁻¹¹.

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