RESISTANCE ANALYSIS: ANTIBACTERIAL POTENCY OF COMMERCIAL TETRACYCLINE AVAILABLE IN ONE OF INDONESIAN PUBLIC HEALTH CENTER

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ABSTRACT

Objective: this study was aimed to evaluate the tetracycline commercial antibiotic potency as one of antibiotics used to treat infections in Indonesian public health centers supporting prevention of bacterial resistance. **Methods:** The potency of tetracycline commercial antibiotic was determined by the agar diffusion method using 3+3 design against *Staphylococcus aureus*. **Results:** The results showed that tetracycline commercial potency was 102 %. **Conclusion:** The commercial tetracycline antibiotics used in the public health center have fulfilled the requirement of Indonesian Pharmacopoeia, not less than 97.5%.

KEYWORDS: tetracycline, commercial, potency, public health center, Indonesia.

INTRODUCTION

The extensive use of antibiotics which is causing the rapid spread of antibiotic resistance poses a high health risk to humans.[1] This limits the use of all antibiotic classes and drives initiatives towards the development of new antibiotics.[2-5] Exceptionless for tetracycline as the old antibiotic that has been used for more than 60 years, have the same potential to cause the spread of acquired -specific resistance mechanisms, especially among clinically important bacterial pathogens.[6] This tetracycline resistance gene is generally present in genetic elements that can be transmitted rapidly and spread throughout diverse bacterial

populations.[7] The tet (M) and tet (O) genes are the most widely reported genes responsible for bacterial resistance to tetracycline antibiotics (e.g., Enterobacteriaceae, Bacteroides spp.) and Gram-positive bacteria (e.g., Streptococcus spp., Enterococcus spp., Staphylococcus spp.).[8]

Tetracyclines have many properties that are considered ideal for antibiotic drugs, including being able to fight Gram-positive and negative pathogens, clinically proven safe, and acceptable tolerability.[9] However as well as other antibiotics, to ensure the successful treatment of infectious disease using antimicrobial therapy, a sufficient concentration of the stable, active drug is required at the site of infection.[10] The chemical degradation of drugs can lead to the loss of potency of the product and promote the bacterial opportunity to develop resistance factors. Therefore, as the confirmation, the stability of the antibiotic structure as the active agent, can be determined by measuring the value of the potency or inhibition of tetracyclines against infection-causing bacteria.[11]

MATERIALS AND METHODS

Materials

The growth media used in this study were Mueller-Hinton Agar (MHA-Oxoid) and Mueller-Hinton Broth (MHB-Oxoid). The chemicals used are normal saline solution, barium chloride solution (Merck), sulfuric acid solution (Merck), tetracycline standard, tetracycline commercial, hydrochloric acid and distilled water. *Staphylococcus aureus* ATCC 29737 was used as tested bacterium, obtained from Laboratory of Microbiology, Faculty of Pharmacy, Padjadjaran University.

Preparation of Bacterial Suspension

Preparation of *S. aureus* was conducted by taking one Ose of *S. aureus* colony from slant agar, then suspended into sterile physiological saline. Bacterial turbidity was measured using a spectrophotometer and compared with a standard 0.5 Mc Farland.

Antibiotic Potency Test

Potency value of tetracycline was determined using the agar diffusion method using a perforation technique. The stock solution of tetracycline was prepared from 10 mg of pure tetracycline and dissolved in 0.1N HCl then added with sterile distilled water up to 100 mL volumetric flask. Then stock solution was diluted using sterile distilled water to achieve the concentration of 0.5, 0.25, and 0.125 µg/mL. A total of 20µL bacterial suspension was

poured into a sterile petri dish, then a volume of 20 mL MHA was poured into the petri dish. The medium was homogenized, allowed to solidify and drilled using perforator aseptically. Each hole is then filled with a solution antibiotics and standard samples in accordance with the variations in concentration in 50 uL. All the medium test was incubated at 37 ° C for 18-24 h. Potency value was calculated using 3+3 design calculation.

RESULTS AND DISCUSSION

Potency Antibiotic Result

The result of the potency tetracycline determination showed that *S. aureus* was sensitive against tetracycline. The commercial tetracycline was more active than the standard against *S. aureus* type sensitive strains. The potency value of commercial tetracycline was 102.76% fulfilled the requirement of Indonesian Pharmacopoeia, not less than 97.5%. It validated that the commercial antibiotics that used in one of public health center in West Java, Indonesia, effective in treating infection especially those caused by *S. aureus,* since the bacteria were sensitive. The inhibitory diameter was presented in Table 1.

Table 1: Diameter of Zone Inhibition.

Antibiotic concentration (µg/mL)	Diameter of Inhibition (mm)	
	Standard	**Commercial**
0.5	12.25±0.05	12.30±0.01
0.25	11.20±0.00	11.07±0.00
0.125	10.34±0.02	10.44±0.02

Note: Perforator diameter = 9 mm

This evaluation is important to determine antibiotic management at the public health center so that it can prevent or reduce the chance of bacterial resistance caused by the instability of the tetracycline structure. The loss of its effectivity will worsen the ability of tetracycline to fight infectious disease. Although microbial resistance occurs primarily as a consequence of the selection pressure of susceptible microbes with the use of therapeutic agents, various social and administrative factors also contribute to the emergence and spread of resistance.[12] Thus, from this result study, we can assume that those factors has been controlled well and can minimize the tetracycline degradation which can promote antimicrobial resistance.

CONCLUSION

The commercial tetracycline antibiotics used in the public health center have fulfilled the requirement of Indonesian Pharmacopoeia, not less than 97.5%.

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