

COMPARISON STUDY OF AGERATUM CONYZOIDES LEAF EXTRACT WITH CONVENTIONAL MATERIALS WOUND COMPRESS TO INHIBIT OF S. AUREUS IN DIABETIC ULCERS

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Article Received on 15/09/2017

Article Revised on 06/10/2017

Article Accepted on 27/10/2017

ABSTRACT

Background: Diabetic ulcer disease can lead to amputation by 40-70%. But with intensive care and have evidence based, can prevent amputation about 45-85%. If not prevented, there will be an amputation every 30 seconds (Consensus diabetes, 2008). Prevention is done such as by controlling the wound. There are many materials conventional to inhibit of *S. aureus* that cause of diabetic ulcers. Bandotan (Indonesia) (*Ageratum conyzoides*) is one of number plants in Indonesia that used to wound healing as traditional medicine a long time. **Aim:** This study is aimed to compare different materials than conventional wound compress with bandotan leaf extract. **Methods:** This research is a quantitative research in vitro design. Research variabel include 0.9% NaCl, 10% povidone, honey, gentamycin, glukobet (sugar and povidone mix), sugar, coffee and extracts bandotan. The cup that contains *S. aureus* was shelled materials compress the wound. As a negative control plate is provided control and a positive control. Exposure to do three repetitions so that we will get an average area of the resistor. **Results:** 2.69% inhibition of honey, sugar 1.6 mm, 0.82 mm coffee, NaCl 0.9% of 0.00 mm, 10% povidone 1.67 mm, 2.47 mm glukobet, gentamycin in 0.9 % NaCl 2.39 mm and leaf extracts bandotan 10% was 4.08 mm. **Conclusion:** Bandotan leaf extracts have inhibitory wider than the other material compresses. **Recommendation:** Study further combination bandotan leaf, honey and sugar to obtain preparations that can be used to compress materials diabetic foot wounds.

KEYWORDS: Diabetic Ulcers, Wound Compresses, *S. Aureus*.

INTRODUCTION

One of the chronic complications of diabetes is diabetic ulcers. Approximately 40% - 70% the cause of leg amputation. 85% of amputations are preceded diabetic foot ulcers. In the world, every 30 seconds amputation of the diabetic foot. Prevention programs can reduce 45-85% incidence of amputation in diabetics.^[1]

One technique is the prevention of diabetic foot wound care using tools and materials that have evidence-based practice.^[1] During this time there are different opinions about the use of materials compress diabetic ulcers. Among uses of honey, sugar, povidone, NaCl 0.9%, Gentamycin and coffee powder. Hospitals that use honey as a complementary therapy in the diabetic ulcer is Ciptomangunkusumo Jakarta hospital. Sugar is used as a complementary therapy in diabetic ulcers are at Hasan Sadikin hospital.^[3] While povidone had not used anymore as a pack of diabetic foot wounds, but no data is why it is not used anymore. NaCl 0.9% is still used throughout the hospital, either to wash the wound or compress.^[4]

The type of bacteria present in the wound generally staphylococcus aureus, in accordance with the concept that staphylococci as the main cause foot infections diabetes mellitus type 2.^[3] Principles of wound care is to minimize bacteria which are present in the wound. The emergence of opinion about wound care will cause confusion for practitioners. Therefore, the research that will be developed on this occasion is a comparative study of various materials compress the wound with bandotan leaf extract in inhibiting bacterial staphylococcus aureus. Bandotan known to contain monoterpenes, sesquiterpenes, kromen, kromon, benzofuran, coumarin, flavonoids, triterpenes, sterols, alkaloids and essential oil.^[6] Leaves bandotan identified as containing three phenolic acid is gallic acid, protocatechuic acid and acid coumalic.

MATERIAL AND METHOD

This research is a quantitative research in vitro. Variabel bound in this study is *s. aureus*. Samples microorganisms such as strains of *S. aureus* bacteria were obtained from the vendor with ATCC (American Type Culture Collection) 25923. The strain, a collection of laboratory

Institut Teknologi Bandung (ITB). The independent variables in this study is the NaCl 0.9%, honey, sugar, povidone 10%, glukobet (a mixture of powdered sugar and povidone 10%), coffee powder, gentamycin, ekstrak bandotan.

The procedure begins with making the research bandotan leaf extract by collecting and preparing the leaves bandotan, washing, drying at 50 ° C oven for 2 days. Having grown dried and filtered, then do macerated with alcohol 96% selanjutnya evaporated to obtain a thick leaf extract bandotan.

The next step is the manufacture of test solutions to choose the cheapest and has the effect of inhibiting bacteria. It is known that a solution of 10% could still hamper staphylococcus aureus Determination of the inhibition zone is done by a petri dish containing media Mueller Hinton Agar (MHA) was prepared. Cotton swab dipped in a test tube containing 0.9% NaCl S.aureus dengan bacteria that turbidity equal to McFarland 0.5. Then the cotton swab to the brim scratched the surface so that MHA medium in a petri dish and spread evenly. The next stage, made a hole wells on each plate, then each leaf extract concentration bandotan included approximately 50µL using a micro pipette. Then the petri dishes were incubated for 24 h at 37 ° C.

Then perform the measurement zone of inhibition, which is a clear area on the surface of the MHA media, around the hole wells using a caliper. This study uses replication 3 times to obtain valid results of tests performed

RESULTS AND DISCUSSION

Result 1: Honey inhibition zone against Staphylococcus aureus

The average honey inhibition zone against Staphylococcus aureus was 2.69 mm in diameter. Honey is a mixture of three kinds of sugar, glucose, fructose and saccharose. Its composition is 80% sugar with 20% water. Honey has high osmotic pressure such as sugar but only 80% of its sugar composition alone. Bacterial cell has a cytoplasm isotonic. If sugars affixed to an existing wound staphylococcus, then the fluid that is in the cytoplasm will move out of the cell to the cell membrane via tail honey. This incident caused staphylococcus cells dehydrate and eventually die.^[13]

Result 2: Sugar inhibition zone against Staphylococcus aureus

Sugar has the inhibitory effect on staphylococcus aureus, average of 1.60 mm. Sugar in large numbers turned out to be important in the preservation process because sugar helps kill bacteria that can lead to botulism. When bacterial cells are in hypertonic sugar solution (high concentration), intra-cell water tend to move out of the bacterial cell into a more concentrated solution through osmosis. This process is called Crenation (crenation),

causing the cells to shrink and eventually no longer function (<http://www.sugarlabinta.com>).

Result 3: Coffee inhibition zone against Staphylococcus aureus

Coffee has an inhibitory effect on staphylococcus aureus. Average power inhibitory 0.82 mm. Coffee powder has a pH 4,5 - 5.0. It corresponds to the skin pH of 4,5 - 5.^[8] Bacterial growth will result in inflammation or infection with pH > 7.3 in wound exudate. While the low pH in the wound fluid creates an unfavorable environment for bacterial growth for growth that will reduce the rate of infection. The results showed inhibition of 0.82 mm. Infuse the coffee has inhibitory effects on the skin are accompanied by the nature MRSA. Activity hygrokopsis coffee powder and high osmolarity solution of coffee powder in the wound fluid, with low pH, a strong antibacterial power, guaranteeing a faster wound healing.^[9]

Result 4: NaCl 0.9% inhibition zone against Staphylococcus aureus

NaCl 0.9% had no inhibitory effect on staphylococcus aureus. Average power inhibitory 0.0 mm. Exposure NaCl 0.9% at an existing wound stafilkokusnya will not cause disruption in the bacterial cell. Due to the strength of the osmotic pressure does not differ anatara intra cells with distilled water. To be able to lyse the bacterial cells necessary substances that can draw fluid from the intra out bacteria cells, so the cells become dehydrated or metabolic disorders.^[10]

Result 5: Povidone 10% inhibition zone against Staphylococcus aureus

Ten percent of povidone have inhibitory long enough in diameter, which is an average of 1.67 mm. Indications povidone is treating and preventing infection in open wounds, cuts scratches, burns, insect bites, wounds from surgery, injuries circumcision, bedsores, irrigation in pleurisy, and osteomyelitis, compress festering wounds, maintain the cleanliness of womanhood and prevent odor, itching caused by fungi and bacteria, treating vaginal discharge due to candida and trikhomonas, as an antiseptic before action is taken infusion, injection or before surgery. Treating skin infections caused by bacteria, fungi, and other skin diseases (Indonesian Pharmacist Association, 2012). Istiqomah research results^[4] show that there are differences in the wound healing process significantly between patients post prostatectomy surgery that wound using Povidone 10% and 0.9% NaCl with p value 0,040. Then povidone 10% better than 0.9% NaCl in the process of wound healing post prostatectomy surgery.

Result 6: Combine of sugar and povidone 10% Inhibition zone against Staphylococcus aureus

A mixture of sugar and povidone 10% have inhibitory effect on staphylococcus aureus with a diameter of 2.47 mm. Mixing between 10% povidone with sugar showed inhibition zone of 2.47 mm. If separated povidone have

inhibitory zone of 1.66 mm, while the povidone has inhibitory zone of 1.67. As described above, when the sugar melting time of the study to see the reaction, because it can not be directly granulated sugar as a whole, the possibility of power osmtiknya be decreased.

Result 7: Gentamycin inhibition zone against *Staphylococcus aureus*

Gentamycin solution have inhibitory long enough in diameter, which is an average of 2.39 mm. Gentamicin is proven to have the effect of inhibiting staphylococcus of 2.39 mm. Gentamicin is an antibiotic aminoglikoside which have bactericidal activity, especially for aerobic gram-negative bacilli sensitive and sensitive gram-positive bacilli only *Staphylococcus aureus*. Mechanism of action of gentamycin is to inhibit protein synthesis and cause errors translocation of genetic code. Preparations gentamicin in the form of a cream to add moisture to the wound so easily happen granulation. The humidity will

accelerate wound healing by increasing cell migration.^[11,12]

Result 8: Bandotan inhibition zone against *Staphylococcus aureus*

Bandotan leaf extract has inhibitory effect on staphylococcus aureus with an average diameter of 4.08 mm. Leaves bandotan (*Ageratum conyzoides* L.) contains flavonoids, alkaloids and phenols. Some flavonoids are reported to have activity as an antimicrobial and antibiofilm compounds, anti-cancer. Flavonoid compounds synthesized by plants as a defense system and in response to infection by microorganisms, so the flavonoid compounds effective as antimicrobial compounds against a number of microorganisms. Flavonoids are one of polyphenol compounds that have a variety of effects, among others, the effects of antioxidants, anti-tumor, anti-inflammatory, antibacterial and anti-virus.^[6]

Table 1: Materials Compress to Inhibit the *S. aureus*.

No.	Material of Wound Compress of Diabetis Ulcus	Inhibition Zone (mm)
1	Honey	2,69
2	Sugar	1,60
3	coffee	0,82
4	NaCl 0.9%	0,00
5	Povidone 10%	1,67
6	Glukobet (combine sugar and Povidone)	2,47
7	Gentamicyn	2,39
8	Bandotan leafe 10% extract (<i>Ageratum Conyzoideus</i>)	4,08

Several types of herbal plants in Indonesia that act as anti-infection have been studied, in the future herbs can be used as an alternative treatment of some types of infectious diseases.^[13]

This research will be developed in the future, through research using the rats being manipulated. in order to obtain biomolecular results, in form of Gene Expression Activity.^[14]

CONCLUSION

Bandotan leaf extract has the most extensive power bland to *S. Aureus*, than other wound compress materials.

ACKNOWLEDGEMENT

Further thanks fundraisers to ministry of health of the republic of Indonesia, and pharmacy biological laborataory team of Tasikmalaya health polytechnic.

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