# ANTI-VIRUS AND BACTERIA MIST TESTING (KAVI-B) TO REMOVE ESCHERICHIA COLI AND STAPHYLOCOCCUS AUREUS BACTERIA

**Imam Tazi[1], Prilya Dewi Fitriasari[2], Agus Mulyono[1], Marvina Rizqi Noor[1], Siska emelda putri[1]**

*[1]Jurusan Fisika, Universitas Islam Negeri Maulana Malik Ibrahim Malang*
*Jl. Gajayana No. 50 Malang 65144, Indonesia*
*[2]Jurusan Biologi, Universitas Islam Negeri Maulana Malik Ibrahim Malang*
*Jl. Gajayana No. 50 Malang 65144, Indonesia*

***Received: 21th August 2021; Revised: 15th September 2021; Accepted: 14th October 2021***

**ABSTRACT**

A disinfectant and antiseptic vaporizer has been made by using a vibrating membrane in the ultrasonic order. This method does not go through the stages of evaporation by heating the material. This machine is capable of converting ethanol in the liquid phase into the form of mist or vapor very quickly. Within 1 second when the engine is started, the cold ethanol material will turn into steam or mist. The concentration of the ethanol solution after and before evaporation did not change significantly. The change in ethanol concentration that occurs is only around 2-5%. The effect of decreasing colonies of Escerichia coli and Staphylococcus aureus bacteria after being given a mist containing 65% ethanol decreased exponentially. This spray has many advantages over using ethanol in liquid form. The sample size of the vaporized ethanol concentration greatly affects the evaporation produced by the KAVi-B engine. A very linear relationship was found between the concentration and the rate of evaporation. The linear relationship between the concentration of ethanol and the rate of evaporation has a linear regression value of Y = 0.2617X + 20.657 and R2 = 0.9908.

**Keywords:** KAV-B, Ultrasonic, Electronic Tongue, Escherichia coli bacteria, Staphylococcus aureus bacteria

## Introduction

In early December 2019, the first cases of severe pneumonia caused by the novel coronavirus covid-19 began to emerge in Wuhan, China. This marked the beginning of a global pandemic that has claimed the lives of more than two hundred thousand people in the US and more than one million people worldwide. (1). The uncontrolled spread of the virus in early 2020 has so far attracted the attention of researchers in the fields of health, science, and engineering (2).

WHO has issued guidelines for personal hygiene to prevent the spread of Covid-19. The guidelines include: washing hands with soap for at least 30 seconds, or using hand sanitizer to clean hands, wearing masks, and keeping a distance from other people. Quarantine and disinfection are needed to prevent the spread of this virus (3). Some of them use methanol, but some use benzalkonium chloride (BKC) as a disinfectant (4).

The recommended disinfectants are chlorine compounds, alcohols, quaternary ammonium compounds, peroxides, and phenolic compounds (5). Iodine is able to penetrate membranes and attack proteins at the sulfuryl and disulfide bonds of viruses and destroy their nucleic acids (5). The US Environmental Protection Agency (EPA) requires the use of several disinfectants that are recognized for preventing harmful bacteria (6).

Ethanol is the active component of antiseptic or disinfectant agents. Ethanol is widely used in the form of gel, foam, or liquid to kill bacteria and viruses (7). The use of ethanol at concentrations between 60% - 95% is quite effective and safe for use outside the body surface such as the surface of the hands (8). The concentration of ethanol in Staphylococcus species showed high effectiveness at concentrations of 70%, 60%, and 50% especially with a longer exposure time (7).

Escherichia coli and Staphylococcus aureus are examples of bacteria that are associated with humans and are pathogenic. S. aureus bacteria is a Gram-positive bacterium that is parasitic on the skin and nose of humans, if the number of these bacteria is large enough it can cause blood vessel infections, disorders of vital organs such as the lungs and heart and bones. Escherichia coli is a Gram negative bacterium that naturally resides in the digestive tract and feces in humans and animals (9).

Researchers from UIN Malang have succeeded in making an anti-virus and bacteria mist booth (KAVi-B). This cubicle is made with the aim of cleaning the outside of our bodies including clothes from various

Corresponding author.
E-Mail: imamtazi@yahoo.com

types of bacteria and viruses. KAVi-B is useful for weakening viruses and bacteria by converting alcohol particles into smog that can kill germs and viruses in 20 seconds. The Anti Virus Fog (KAVi-B) system works by spraying smog into the air so that it can bind bacteria and viruses that are all over the outside of the body, including clothes and pants (10).

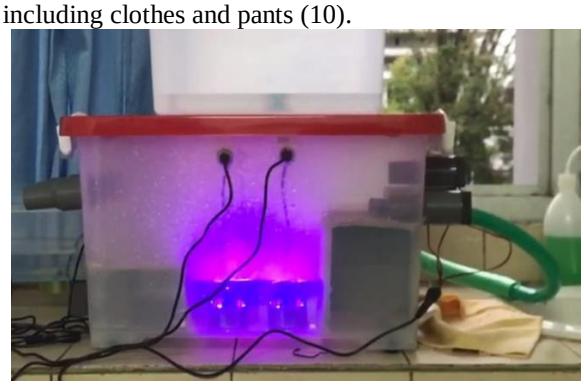

Figure 1. Anti Virus and Bacteria Fog Machine (KAVi-B)

KAVi-B is an appropriate technology that was created at the beginning of the pandemic, but there are no research results that can prove the claims of KAVi-B.

Based on the above background, we examined the capabilities and reliability of this KAVi-B machine. It is very important that this research be carried out, considering that KAVi-B is still an appropriate technology and has not been able to prove its reliability in killing viruses and bacteria.

## Research methods

The method used to solve the research problem consists of 2 parts, namely: Testing of Vapor Compounds produced by KAVi-B and Testing of Vapor KAVi-B in killing bacteria**.**

In the first method, this is done by comparing the concentration of the ethanol sample before it is evaporated with the ethanol sample after it has been evaporated. In this method, the evaporation rate by the KAVi-B machine is also investigated. The second method is to test the ability of the KAVi-B machine to kill Escherichia coli (E. coli) and Staphylococcus aureus bacteria.

## Results and Discussion

Changes in the concentration of the ethanol solution after and before evaporation can be seen in Figure 1. that there is no significant change in the data. The change in ethanol that occurs is only around 2-5%. The initial measurement of the ethanol content was carried out before the ethanol solution was entered into the KAVi-B chamber while the final measurement of the ethanol content was carried out after the solution distillation process ended. This machine uses a membrane capable of vibrating with a frequency of 1.6 MHz, which means the membrane will vibrate 1,600,000 times every second. When the membrane is in a liquid fluid in this case is ethanol, then the ethanol material will also vibrate following the vibration of the membrane.

The ethanol molecules undergo a rapid phase change process from the liquid phase to the gas phase. Due to this evaporation process without evaporation, the concentration of ethanol which was originally in liquid form did not change significantly compared to the original concentration. In this study, the evaporation process is still difficult or cannot be explained physically or chemically. However, experimental evidence can prove that the evaporation process using the help of an ultrasonic vibrator can result in the evaporation of ethanol liquid without changing the molecular structure of the material.

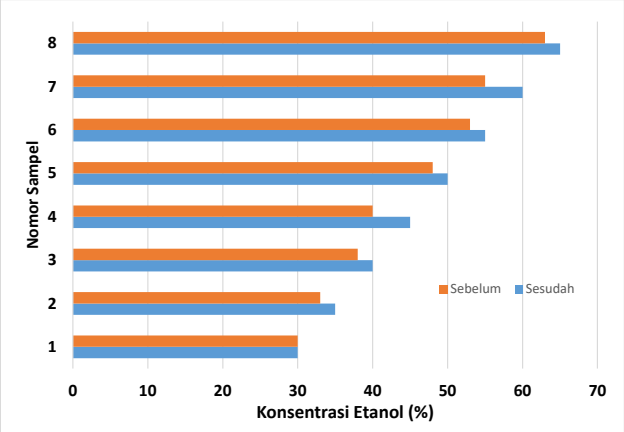


Figure 2 Comparison of the amount of ethanol content before and after being evaporated by a cavi machine starting from a concentration of 30% to 65%

Figures 3 and 4 show the results of the effect of decreasing the colony of Escerichia coli and Staphylococcus aureus bacteria after being given a mist containing 65% ethanol. Figure 2 provides an overview of the factors for decreasing the number of Escerichia coli bacteria due to KAVi-B fog. from the graph, it shows the relationship of exponential decline in accordance with the regression equation above. In accordance with previous results that the resulting mist is an ethanol compound. In theory, it is said that ethanol compounds are one of the antiseptic and disinfectant ingredients that are able to control and eradicate bacteria and viruses.

In this study, it was proven that although ethanol was converted into mist, the benefits for eradicating and controlling bacteria were very good. This spraying has many advantages over using ethanol in liquid form. The benefits of saving ethanol are very important, because this material is also relatively expensive. Another benefit is in the form of fog, the area that is subject to spraying becomes wider, for humans and medical

equipment it can be utilized to a wider area. Almost the same graph is also shown by Figure 4 for Staphylococcus aureus bacteria.

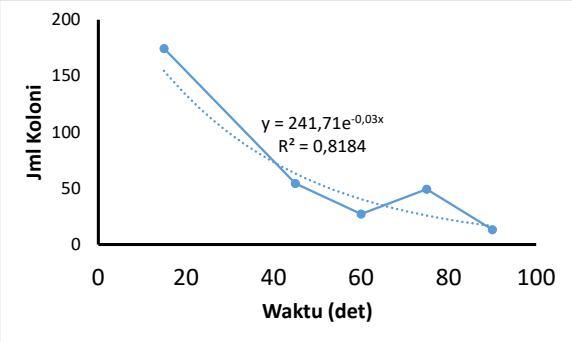


Figure 3. Graph of the decrease in the number of Escherichia coli bacterial colonies due to exposure to KAVi-B mist with a concentration of 65%

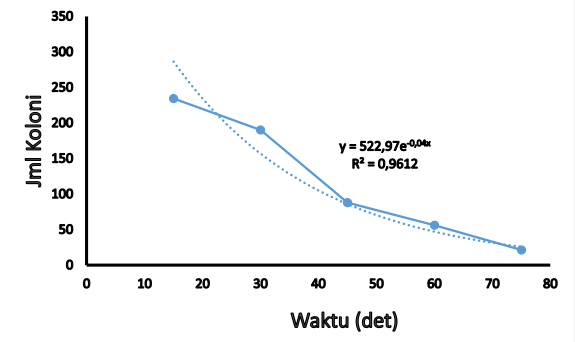


Figure 4. Graph of the decrease in the number of Staphylococcus aureus bacterial colonies due to exposure to KAVi-B mist with a concentration of 65%

The rate of evaporation of course really needs to be tested, this is because the rate of evaporation is predicted to also contribute to the process of killing bacteria. Based on observations, the concentration of ethanol that is vaporized greatly affects the evaporation produced by the KAVi-B engine. It is very interesting to study that the results of the evaporation rate from the KAVi-B engine as shown in Figure 5 show a very linear relationship between the concentration and the evaporation rate. For small concentrations it produces a lot of steam, even as smoke from combustion. When the concentration reaches 70%, the evaporation rate becomes very small, even smoke is almost invisible.
The evaporation rate has a very linear characteristic. The linear relationship between the concentration of ethanol and the rate of evaporation has a linear regression value of Y = 0.2617X + 20.657 and R2 = 0.9908. The evaporation process of KAVi-B uses the help of a piezoelectric membrane capable of vibrating up to 1.6 MHz. This quantity refers to when the piezoelectric membrane is immersed in pure water or a liquid with a specific gravity of 1. The greater the concentration, the greater the specific gravity. This specific gravity can cause the membrane's ability to vibrate. The greater the specific gravity, the weaker the membrane will be. So that in laboratory observations, the evaporation rate of KAVi-B can be seen as shown in Figure 5

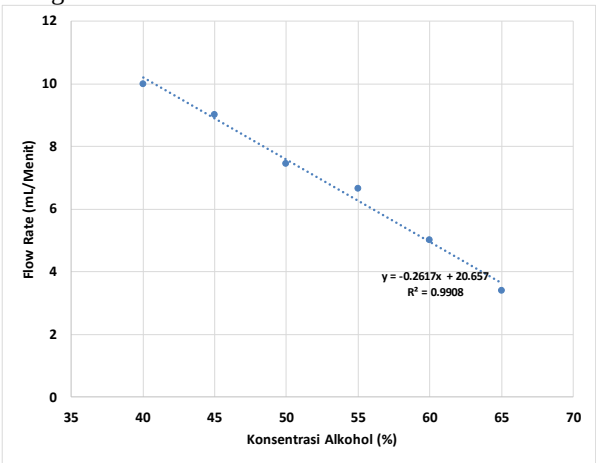


Figure 5. The graph of the relationship between the concentration of ethanol samples and the rate of decrease or increase in evaporation of ethanol on the KAVi-B . engine

## Conclusion

Changes in the concentration of the ethanol solution after and before evaporation did not change significantly. The change in ethanol that occurs is only around 2-5%. The ethanol molecules undergo a rapid phase change process from the liquid phase to the gas phase. From experiments it can be proven that the evaporation process using the help of ultrasonic vibrators produces evaporation without changing the molecular structure of the material.

The effect of decreasing colony of Escerichia coli and Staphylococcus aureus bacteria after being given 65% ethanol mist showed an exponential decreasing relationship. Evaporation rate has a very linear relationship between the concentration of ethanol and the rate of evaporation. Evaporation rate relationship This results in a linear regression Y = 0.2617X + 20.657 and R2 = 0.9908.

## Acknowledgments

This study was funded by the Ministry of Religion of the Republic of Indonesia and LP2M UIN Maulana Malik Ibrahim Malang. The author also thanks the Directorate General of Islamic Education, for the support, congratulations on the completion of this job.

## Referensi

1. Ejtahed H, Hasani-ranjbar S, Siadat SD, Larijani B.

The most important challenges ahead of microbiome pattern in the post era of the COVID-19 pandemic. Journal of Diabetes & Metabolic Disorders; 2020;2031–3.
2. Steingard S. Community Mental Health Journal and the Covid19 Pandemic. Community Ment Health J [Internet]. Springer US; 2020;56(7):1201. Available from: https://doi.org/10.1007/s10597-020-00696-3
3. Das A, Mitra S, Kumar S, Sengupta A. Two - drape closed pocket technique : minimizing aerosolization in mastoid exploration during COVID - 19 pandemic. Eur Arch Oto-Rhino-Laryngology [Internet]. Springer Berlin Heidelberg; 2020;277(12):3529–32. Available from: https://doi.org/10.1007/s00405-020-06353-5
4. Shehata MA, Adel A, Armaneous AF, Sonbaty MMEL, Atti MA, Mohamed H, et al. Egyptian school children awareness and precautions in Covid19 pandemic : a cross sectional survey study. Bull Natl Res Cent [Internet]. Springer Berlin Heidelberg; 2021; Available from: https://doi.org/10.1186/s42269-021-00495-0
5. Dear K, Grayson L, Nixon R. Potential methanol toxicity and the importance of using a standardised alcohol-based hand rub formulation in the era of COVID-19. Antimicrobial Resistance & Infection Control; 2020;5:10–2.
6. Sifuentes LY, Koenig DW, Phillips RL, Reynolds KA, Gerba CP. Use of Hygiene Protocols to Control the Spread of Viruses in a Hotel. 2014;175–81.
7. Sauerbrei A. Bactericidal and virucidal activity of ethanol and povidone-iodine. Microbiologyopen. 2020;9(9):1–27.
8. Kampf G, Hollingsworth A. Comprehensive bactericidal activity of an ethanol-based hand gel in 15 seconds. Ann Clin Microbiol Antimicrob. 2008;7:1–6.
9. Komang Trisno, Ketut Tono PG IGKS. Isolasi dan Indentifikasi Bakteri Escherichia Coli dari Udara pada Rumah Potong Unggas Swasta di Kota Denpasar. Indones Med Veterinus. 2019;8(5):685–94.
10. Tazi I. Kabut Anti Virus (KAVi) untuk pencegahan covid-19. Malang; 2020.

 ISSN:1979-6374/ EISSN:2460-599