

The Battle of Antibiotics: A Study of Herbal and Modern Medicine



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ABSTRACT: In Thailand during the pandemic of Covid-19, it was firmly believed that a traditional herb could cure the symptoms and reduce the incubation time of the SARS-COV virus. Despite all that, there are also many other diseases and symptoms that were believed to be cured better by herbal antibiotics. This research aims to investigate the performance of herbal antibiotics, in comparison to the modern antibiotics which are internationally recognized. The research has been done by gathering 6 samples of antibiotics with 3 of modern antibiotics, Amoxicillin, Roxithromycin and Norfloxacin, and 3 of herbal antibiotics, Turmeric, Garlic, Green Chiretta ("Fah Talai Jone" in Thai language.) The medicines are added with recommended dosage per day of each, into serial diluted E. Coli cultures by using the plate pour method. All the samples were incubated for 72 hours and were taken out to collectively count the colonies. The alternative hypothesis of the research was that the modern antibiotics will perform better than the herbal antibiotics. As a result, the alternative hypothesis was proven true. Garlic and Roxithromycin work the best with 100% and the others relatively lesser. Green Chiretta on the other hand, had 32.38% efficiency which was the least.

KEYWORDS: Herbal medicine, Herbal vs Modern, Microbiology

I. INTRODUCTION

As the pharmaceutical industry continues to grow in synthetic medication, herbal medication is becoming underutilized and stigmatized. In truth, herbs and plants have made up the backbone of pharmacy for decades. According to the World Health Organization, "Around 40% of pharmaceutical products today draw from nature and traditional knowledge, including landmark drugs" [1]. From supplements to even malaria, herbs have played a massive role in the medication patients consume daily. As of now, herbs are only used in the initial research process, and are never the final product. Numerous illnesses ranging from pneumonia, cholera and tuberculosis are caused by bacteria. Bacteria-Caused diseases are often treated using antibiotics. Antibiotics often do this by destroying the cell wall, preventing reproduction, or inhibiting protein synthesis [2]. Both herbal and modern antibiotics have their own way of controlling bacteria growth. The most prominent difference between modern antibiotics and herbal antibiotics is that modern antibiotics are made via bacteria fermentation while herbal medicines use the entire plant [3]. This often means herbal medicines often include other compounds [4] that can implicate the body in diverse ways, but modern antibiotics are designed to directly target the bacteria. This begs the question of whether the said external compounds in herbal medicines would have the same efficiency as modern medicines.

II. MATERIALS AND METHODS

A. Aseptic technique

Always flame the mouth of any glassware such as flasks, test tubes or Duran bottles in order to prevent contamination [5]. Take note to keep all unused instruments within the area of the flame to prevent contamination. Before and after conducting any experimentation, spray 70% ethanol solution onto a piece of tissue and wipe down the working area. This is not only to disinfect the working area before the investigation but to also prevent harboring any contagious bacteria on the working area. Always wear appropriate PPE (Personal Protective Equipment), which includes laboratory coat, safety goggles, gloves and closed footwear [6]. The lab is prone to accidents including fire hazards, splashes, contamination and other accidents, therefore conductors of the experiment are responsible for their own safety. Spray 70% ethanol after wearing gloves to avoid contamination as well.

B. Serial Dilution

Serial Dilution of the E.Coli culture was used to test which dilution factor should be used for the final experiment. After counting the colonies, the dilution factor of 10^{-2} was the most suitable. The mass of each antibiotic was measured using a precision

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balance to ensure it was in accordance with the dosage value. The bacteria culture was serially diluted to a dilution factor of 10^{-2} in a conical tube and each antibiotic was dissolved into its respective conical tube. In total, there were 6 tubes containing antibiotics and 1 control tube. The conical tubes were left in the incubator at 37°C overnight. Using an automatic pipette, each solution in each conical tube was placed into its respective petri dishes and incubated at 37°C for 3 days. Total Viable Count was conducted for the final results.

III. RESULTS

Total Viable Count	Medication Used						
	Norfloxacin	Roxithromycin	Amoxicillin	Garlic	Turmeric	Green Chiretta	Control
Original	33	0	33	0	4330	5430	8030
$n10^{-1}$	3.3	0	3.3	0	433	543	803
$n10^{-2}$	0.33	0	0.33	0	43.3	54.3	80.3

Figure I Raw Data Calculation

	Norfloxacin	Roxithromycin	Amoxicillin	Garlic	Turmeric	Green Chiretta
Percent Efficiency	<u>99.59%</u>	<u>100%</u>	<u>99.59%</u>	<u>100%</u>	<u>46.08%</u>	<u>32.38%</u>

Figure II Percent Effectiveness of Each Antibiotics

	Modern Antibiotics	Herbal Antibiotics
Percent Effectiveness (out of 300%)	<u>299.18%</u>	<u>178.46%</u>
Percent Effectiveness (out of 100%)	<u>99.73%</u>	<u>59.49%</u>

Figure III Percent Effectiveness of Two Types of Antibiotics

IV. CONCLUSION

The modern antibiotics (99.73%) had a higher percent effectiveness than herbal antibiotics (59.49%). The highest performing modern antibiotic was Roxithromycin with 100% efficiency while Norfloxacin and Amoxicillin had an efficiency of 99.59%. This is because synthetic antibiotics were developed using bacteria fermentation, which uses the specific bacteria the antibiotic is meant to target. The highest performing herbal antibiotic was Garlic with 100% efficiency, however the lowest performing herbal antibiotic was Green Chiretta with 32.38% efficiency. Herbal antibiotics were not designed to target bacteria and hence, it is a myth that herbs can act as antibiotics. Since only E.Coli was used in the experiment, this doesn't signify that certain antibiotics do not perform well. While modern antibiotics are more effective than herbal antibiotics, this experiment also displayed the potential of herbal antibiotics.

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