

Determination of minimum inhibitory concentrations (MICs) of antibacterial agents for bacteria isolated from malva

Introduction

- Many bacteria, in particular, have unpredictable susceptibilities to antimicrobial agents, and their susceptibilities can be measured in vitro to help guide the selection of the most appropriate antimicrobial agent.

Susceptibility to antibiotics

- The term susceptible means that the microorganism is inhibited by a concentration of the antimicrobial agent.
- The term resistant indicates that the microorganism is resistant to a concentrations of the antimicrobial agent.

The aim of this project

- To determine the minimum inhibitory concentrations [MICs] of antimicrobial agents.
- And to identify the microorganisms that are susceptible or resistance to the antibiotics.

Antimicrobial susceptibility tests

Minimum inhibitory concentration [MIC]

- The lowest concentration of antimicrobial agents that will inhibit the visible growth of a microorganism. Widely used in the comparative testing of new agents.

Dilution methods (agar dilution or broth dilution)

- Used to determine the [MICs] and are the reference methods for antimicrobial susceptibility testing.

Agar dilution test

- Is the standard method for determining levels of microbial resistance to an antimicrobial agent.
- Serial dilutions of the test agent are made in a agar microbial growth medium which is inoculated with a few amount of microorganisms and incubated for a prescribed time.
- The lowest concentration (highest dilution) of test agent preventing the appearance of growth is considered to be the minimum inhibitory concentration (MIC).

Materials used

- Different enrichment and selective medium.
- Culture.
- Subculture.
- MIC test.

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MIC medium

I. Clear choice for a reference medium remains to be determined,

- Nutrient agar/broth: used for the cultivation of a wide variety of microorganisms.
- Brain-Heart Infusion agar
- Mueller-Hinton II agar

II. Media for Bacterial identification

- EMB agar.
- MacConkey agar.
- Triple Sugar Iron agar.
- Nutrient agar/broth.

Antimicrobial agents tested (Figure 1–Figure 4)

- Lincomycin.
- Cefaclor.
- Ampicillin.
- Gentamicin.



Figure 1 Increase the concentration of Lincomycin.

Antimicrobial agents Tested

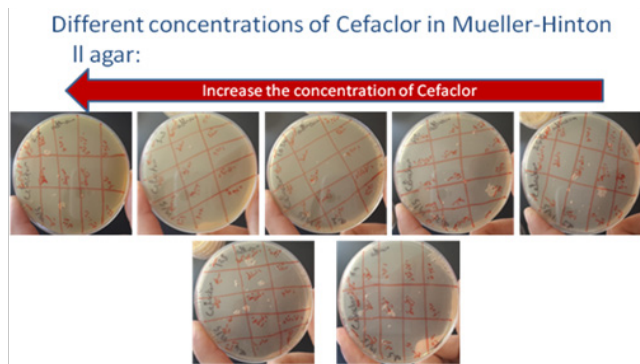


Figure 2 Increase the concentration of Cefaclor in Muller-Hinton II agar.

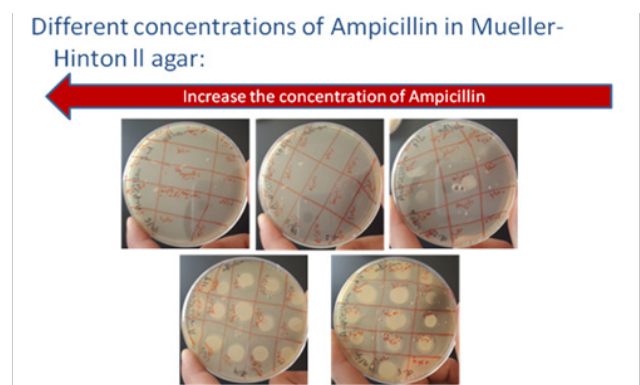


Figure 3 Increase the concentration of Ampicillin in Muller-Hinton II agar.



Figure 4 Increase the concentration of Gentamicin Muller-Hinton II agar.

Discussion

Identification: matching characteristics of an unknown to lists of known organisms.

- Several culture and subculture for the bacterial samples done to reduce the number of bacterial colonies that have been isolated.
- Three different types of media used for identification, (EMB agar, Triple Sugar Iron agar, and MacConkey agar).
- For each sample, the three different types of media showed the same result (same species, which is identified by the morphology).

Result

a. Bacterial isolates identification

Bioinformatics, Computational Methods (Table 1-Table 3).

Table 1 Bacterial isolates identification

Samples from different regions	Types of media		
	EMB agar	Triple Sugar Iron agar	MacConkey agar
القويسمة	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>
أبو نصير	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>
الجبيهة	<i>Proteus vulgaris</i>	<i>Proteus vulgaris</i>	<i>Proteus vulgaris</i>
الويذة	<i>Pseudomonas aeruginosa</i>	<i>Pseudomonas aeruginosa</i>	<i>Pseudomonas aeruginosa</i>
عين الباشا	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>

Table 2 Bacterial isolates identification

	EMB agar	Triple Sugar Iron agar	MacConkey agar
المدينة الرياضية	<i>Citrobacter freundii</i>	<i>Citrobacter freundii</i>	<i>Citrobacter freundii</i>
مادبا	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>
رحاب	<i>E.coli</i>	<i>E.coli</i>	<i>E.coli</i>
الزرقاء	<i>Klebsiella pneumoniae</i>	<i>Klebsiella pneumoniae</i>	<i>Klebsiella pneumoniae</i>
السييل	<i>Proteus vulgaris</i>	<i>Proteus vulgaris</i>	<i>Proteus vulgaris</i>
جانب السييل	<i>Salmonella typhi</i>	<i>Salmonella typhi</i>	<i>Salmonella typhi</i>

Table 3 Bacterial isolates identification

	EMB agar	Triple Sugar Iron agar	MacConkey agar
حي نزال	<i>Citrobacter freundii</i>	<i>Citrobacter freundii</i>	<i>Citrobacter freundii</i>
السد	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>	<i>Proteus mirabilis</i>
السلط	<i>Salmonella typhi</i>	<i>Salmonella typhi</i>	<i>Salmonella typhi</i>
شفا بدران	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>	<i>Shigella flexneri</i>

Conclusion

- Lincomycin, generally considered a bactericidal antibiotic, for these bacteria, the MIC was at dilution (512mg), but also there are three different types of bacteria which resists the Lincomycin at the same dilution (512), these bacteria are (*Shigella flexneri*, *Proteus mirabilis*, and *Proteus vulgaris*).
- Cefaclor and Gentamicin, generally considered a bactericidal antibiotics, for these bacteria, the MIC was at dilution (64mg), which means that all the bacterial samples are sensitive to these types of antibiotics at their different concentrations (Cefaclor and Gentamicin).¹⁻⁸

Acknowledgements

None.

Conflict of interest

The author declares no conflict of interest.

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