

Natural antibiotic alternatives, are they worth a shot?

Clàudia Sendrós



Agenda

Introduction:

- 🦠 Hypothesis and goals.

Theory:

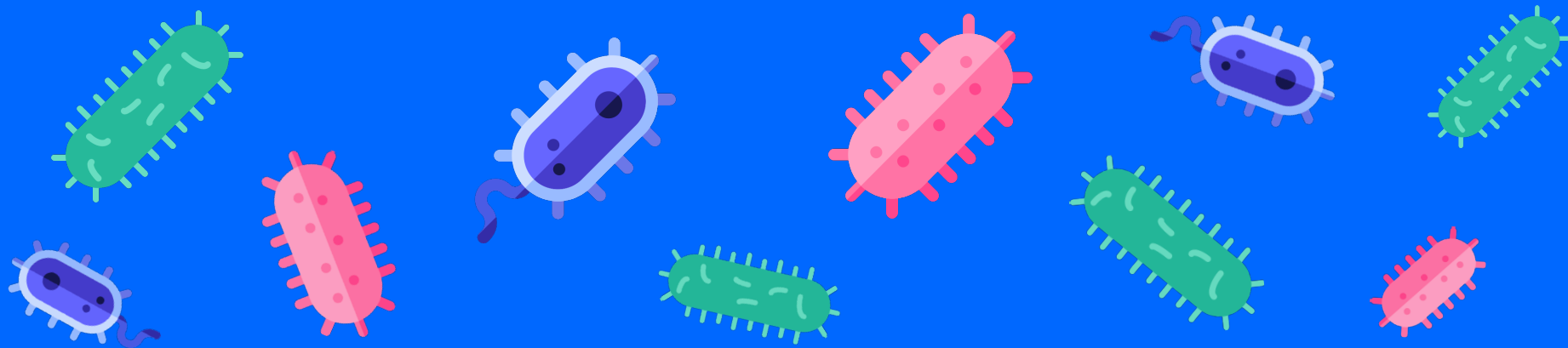
- 🦠 Bacteria.
- 🦠 Antibiotics.
- 🦠 Antibiotic resistance.

Experimentation with natural antibiotics.

Conclusion.

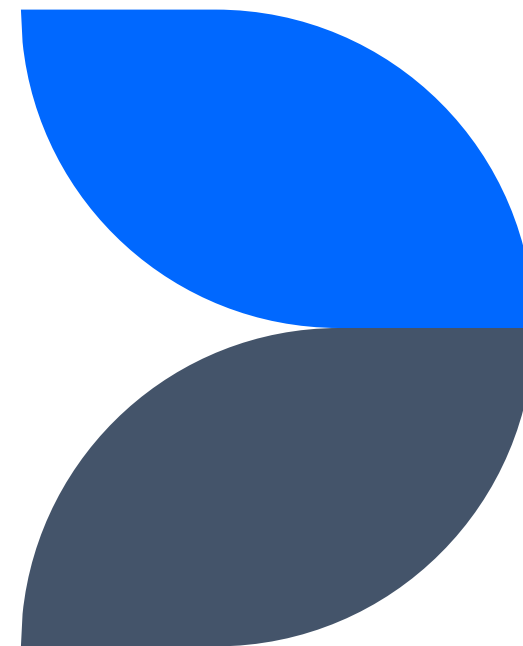
Introduction

“Antibiotic resistance is estimated to cause 10 million deaths per year by the year 2050 onwards.” (Tagliabue A and Rappuoli R. 2018)



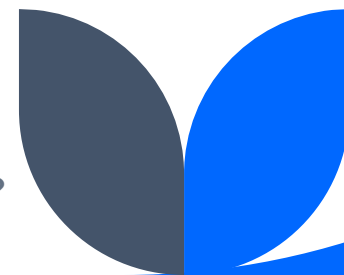
Hypothesis

Natural products with antibiotic properties could be more or as effective as chemical antibiotics.

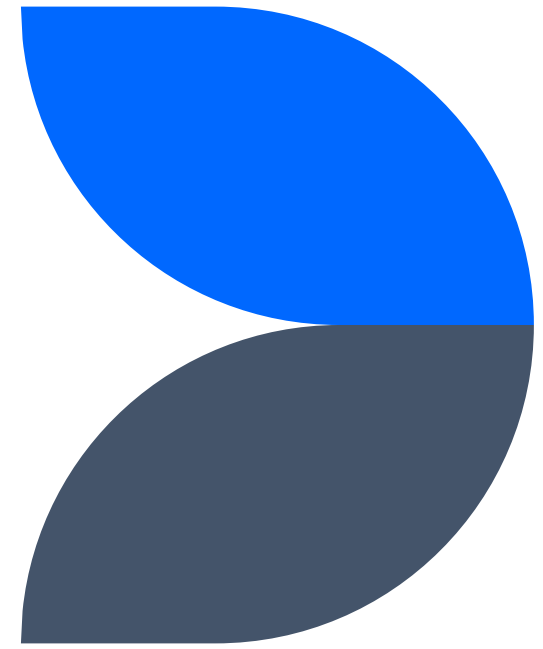


Goals

- 🦠 Raise awareness about the antibiotic resistance crisis.
- 🦠 Have a greater understanding of bacteria and antibiotics.
- 🦠 Investigate natural antibiotic alternatives.



Theoretical context

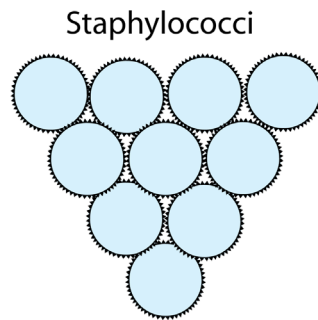


Bacteria

“Bacteria are small simple single-celled microorganisms, that come in different shapes, arrangements and sizes. These microorganisms can be found almost anywhere”



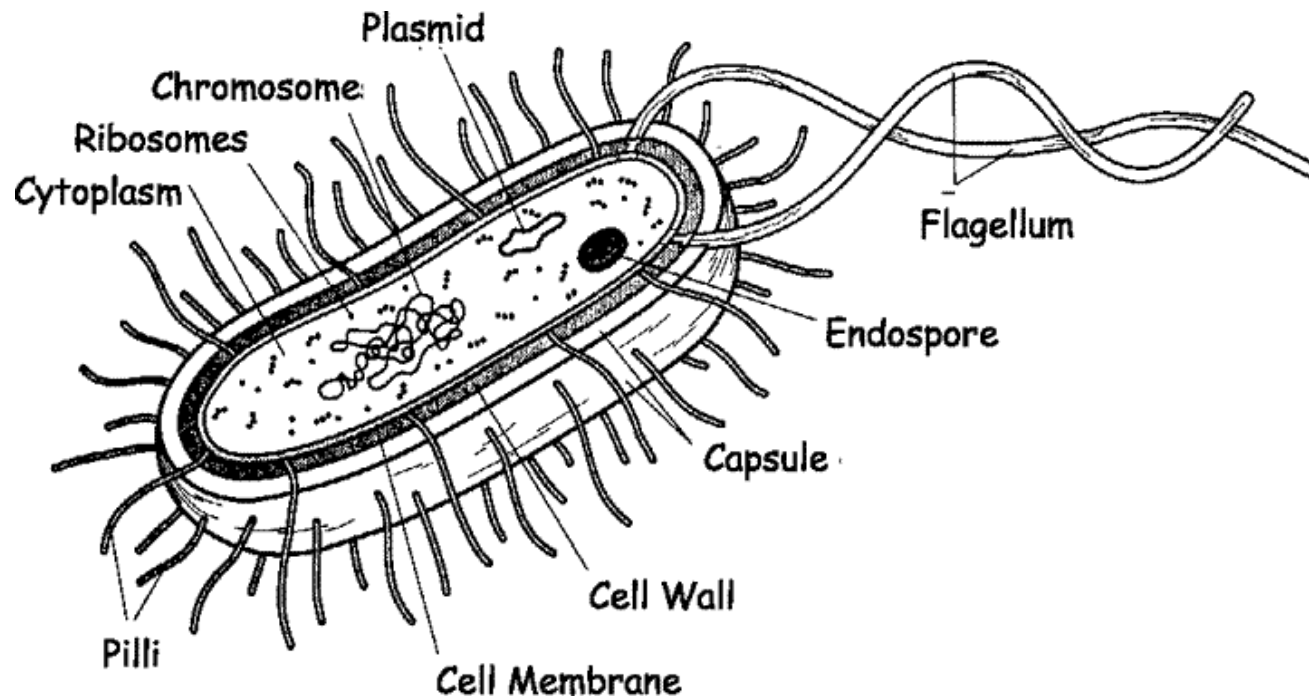
Bacillus



Spirochetes

Natural antibiotic alternatives, are they worth a shot?

Bacteria structure

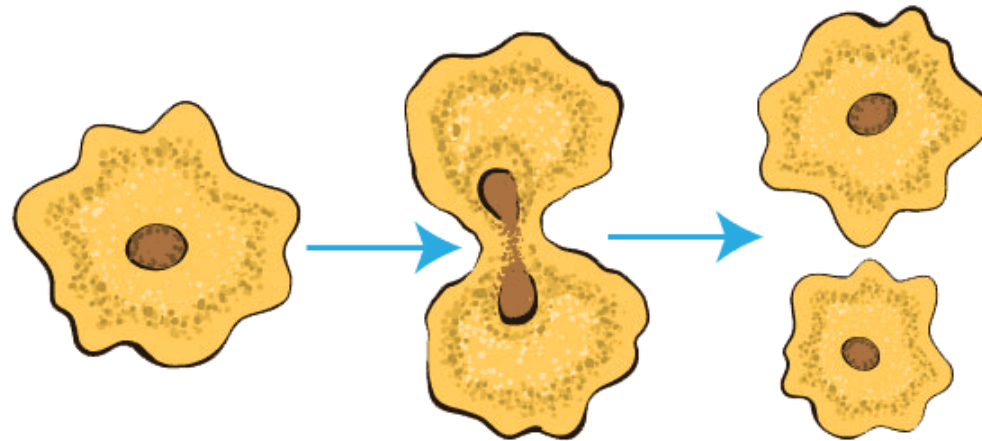


Natural antibiotic alternatives, are they worth a shot?

Bacterial reproduction and resistance acquisition

🦠 Parasexual and asexual reproduction.

“Once bacterial cells acquire resistance, exposure to antibiotics kills off non-resistance bacteria, while the antibiotic-resistant bacteria proliferate.”



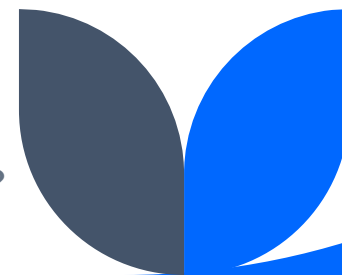
Natural antibiotic alternatives, are they worth a shot?

Antibiotics

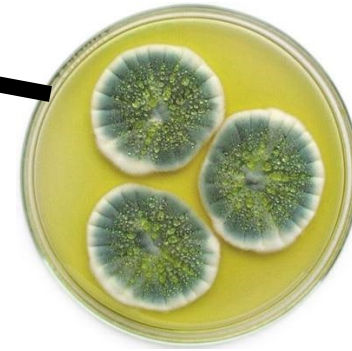
“An antibiotic is a substance that can be used to treat or prevent distinct types of bacterial infections, any substance that can kill bacteria is considered an antibiotic”



Natural antibiotic alternatives, are they worth a shot?



History of antibiotics

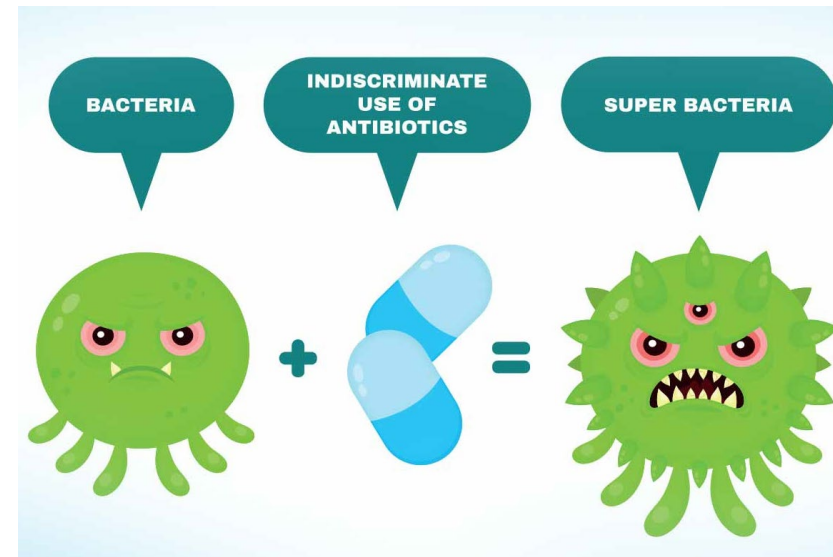


Natural antibiotic alternatives, are they worth a shot?

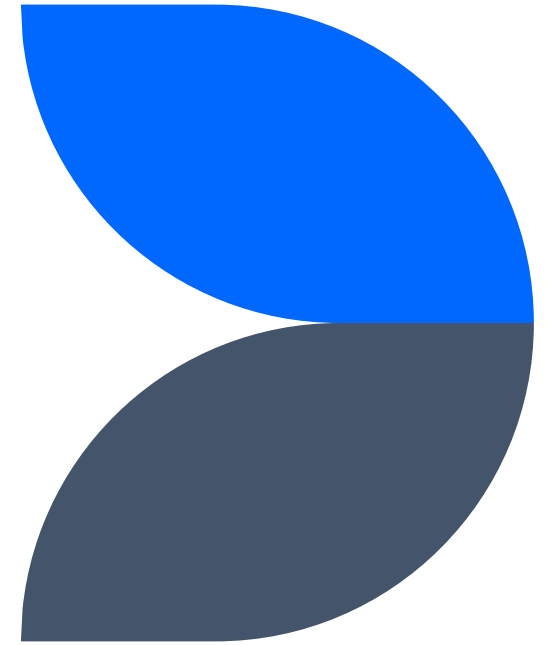
Antibiotic resistance crisis

Causes:

- 🦠 Overuse of antibiotics.
- 🦠 Use of antibiotics in livestock.
- 🦠 Incorrect prescriptions.
- 🦠 Lack of new antibiotics.
- 🦠 Harsh regulatory barriers.



**Experimentation with
Natural Antibiotics.**



Introduction

“One of the main ways to combat AMR is through the development of new antibiotics”



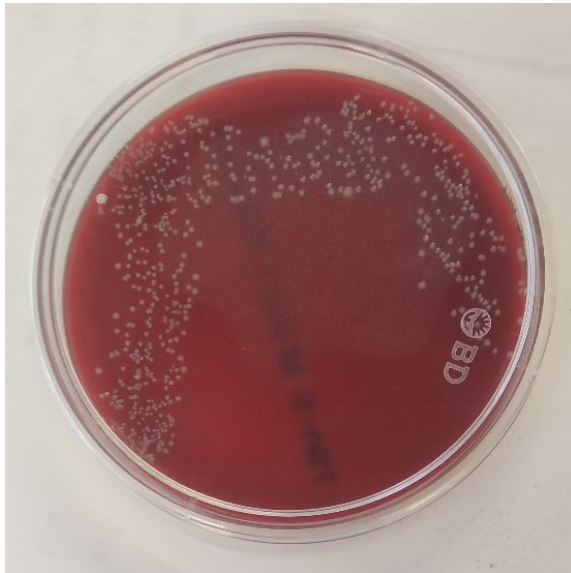
Natural antibiotic alternatives, are they worth a shot?

Natural antibiotics



Natural antibiotic alternatives, are they worth a shot?

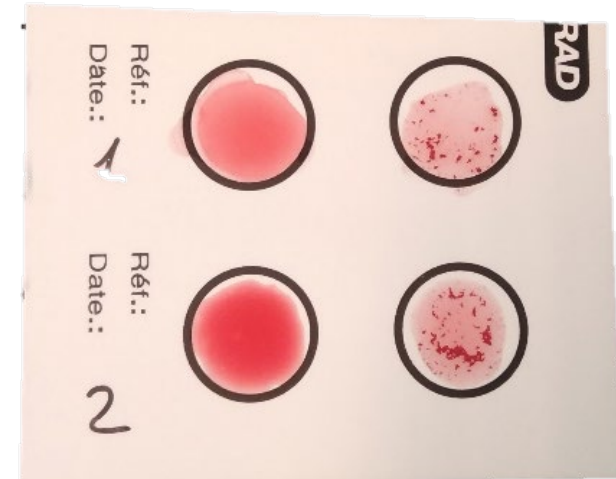
Tested bacteria



Blood agar plate with bacteria from a nasal swab.



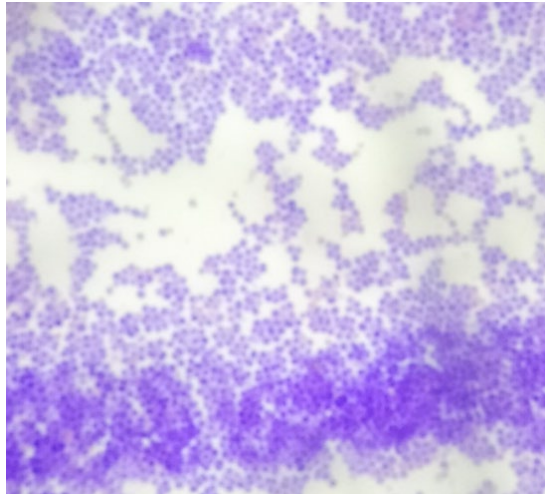
Catalase test, nasal swab 1 (L), nasal swab 2 (R).



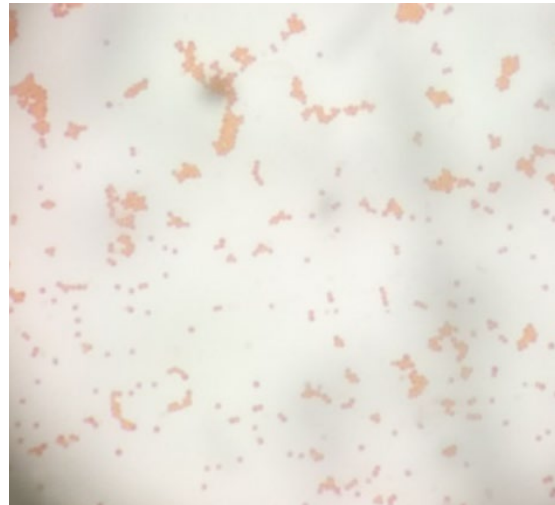
Coagulase test, nasal swab 1 (Top), nasal swab 2 (Bottom).

Natural antibiotic alternatives, are they worth a shot?

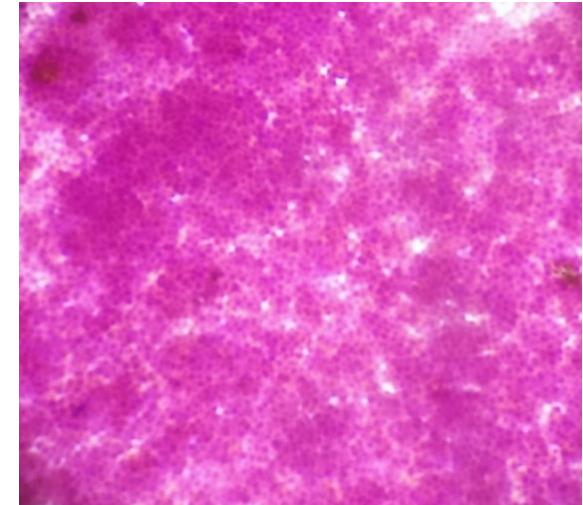
Tested bacteria



Nasal swab 1:
Catalase positive, Coagulase positive, Gram-positive, Staphylococci shaped.



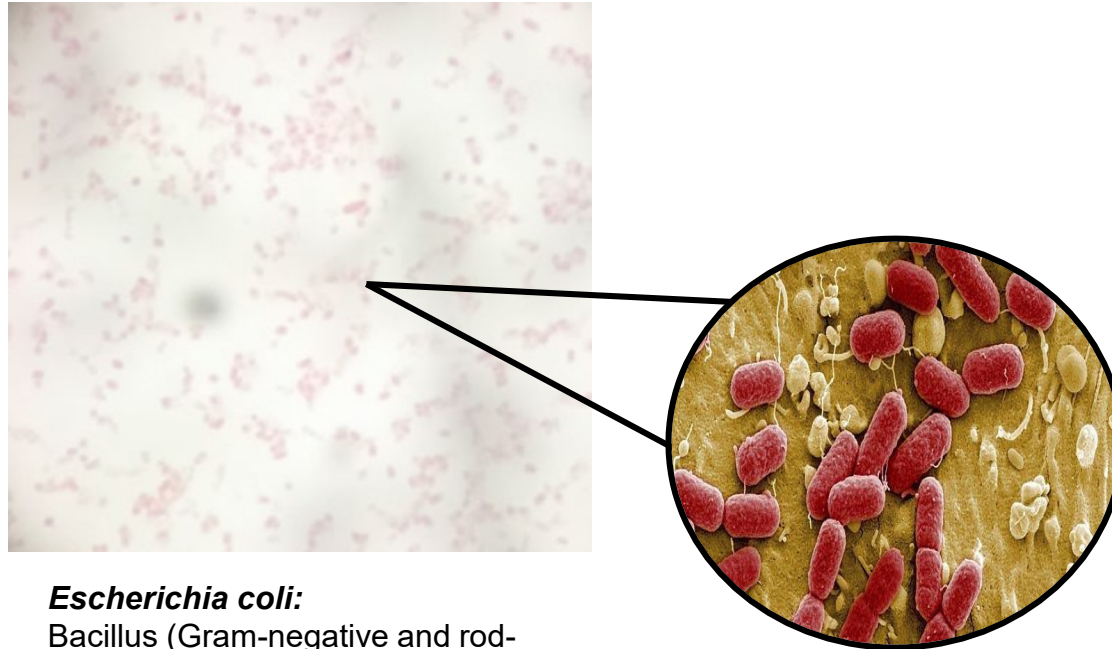
Nasal swab 3:
Catalase negative, Gram-negative, Coccus-shaped.



Pharynx swab 1:
Catalase negative, gram-negative, coccus shaped.

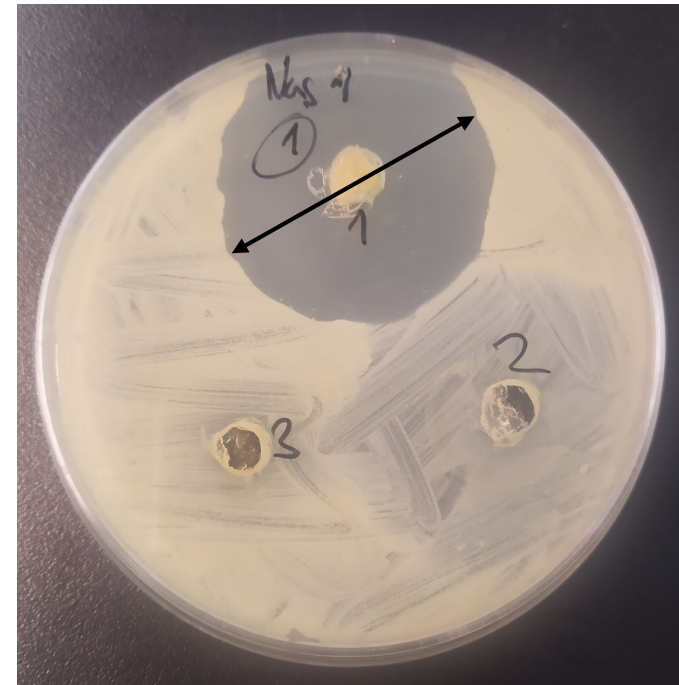
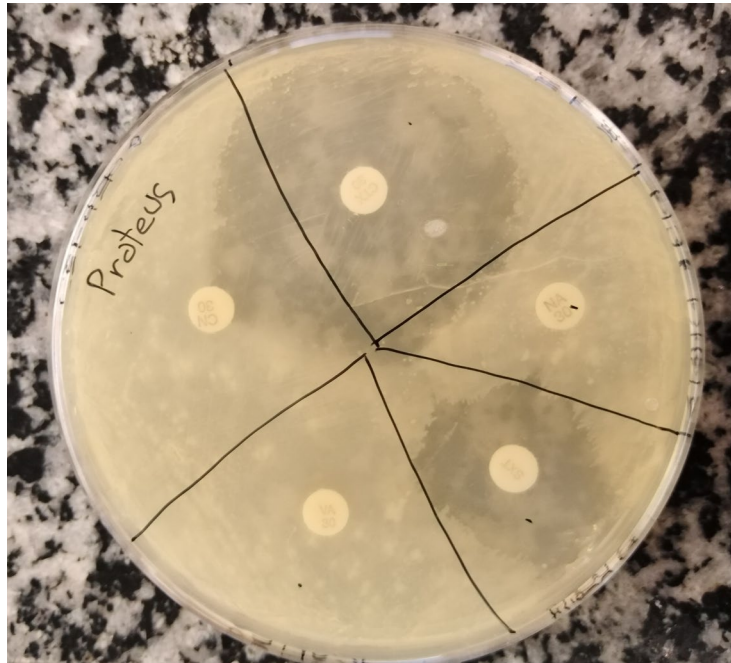
Natural antibiotic alternatives, are they worth a shot?

Tested bacteria



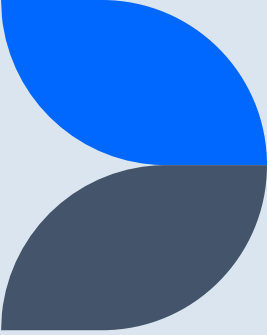
Escherichia coli:
Bacillus (Gram-negative and rod-shaped).

Kirby-Bauer sensitivity testing



Natural antibiotic alternatives, are they worth a shot?

Results



Inhibition zone (mm)				
Alternative antibiotic:	<input type="text" value="E. coli , clone 1"/>	<input type="text" value="E. coli, clone 2"/>	<input type="text" value="E. coli , clone 3"/>	<input type="text" value="E. coli (Arithmetic mean)"/>
Garlic	33	28	28	29.7
Honey	34	34	46	38.0
Orange juice (Natural)	15	0	0	5.0
ACV	30	33	27	30.0
Organic tea tree leaf essential oil	22	21	22	21.7
Cranberry Syrup	35	35	34	34.7
Ethylc alcohol 96°	20	24	27	23.7
Calendula tincture	22	15	17	18.0
Thyme Extract	14	13	20	15.7
Balsamic Vinegar	0	0	0	0.0

Natural antibiotic alternatives, are they worth a shot?

Results

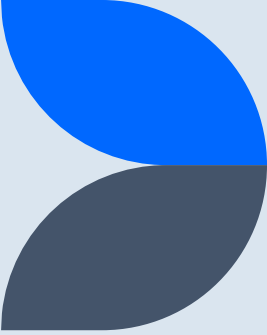
Antibiotic sensitivity testing Zone of inhibition (mm):

Antibiotic:	<i>Escherichia Coli</i>
Cefalexin	12
Cefotaxim	27
Nalidixic acid	22
Vancomycin	0
Sulfamethoxazole	0



Natural antibiotic alternatives, are they worth a shot?

Results



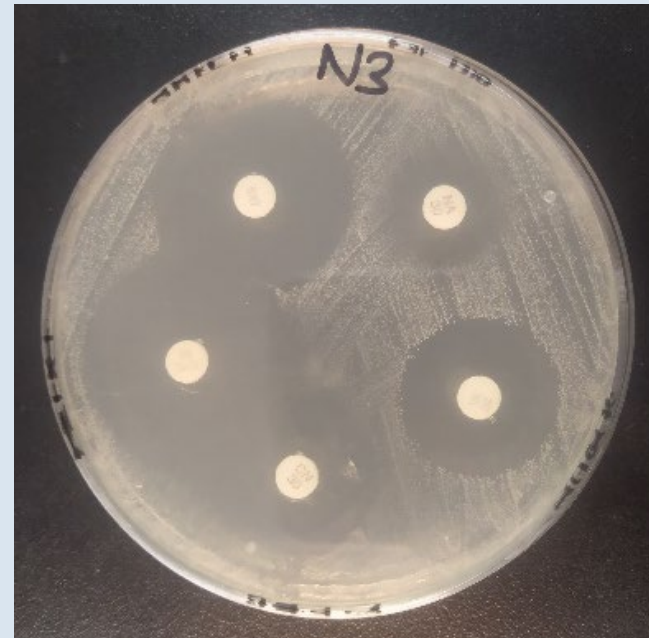
Inhibition zone (mm)					
Alternative antibiotic:	Nasal swab 3, clone 1	Nasal swab 3, clone 2	Nasal swab 3, clone 3	Nasal swab 3 (Arithmetic mean)	
Garlic	49	43	45	45.7	
Honey	0	0	0	0.0	
Orange juice (Natural)	0	0	0	0.0	
ACV	42	50	52	48.0	
Organic tea tree leaf essential oil	24	21	25	23.3	
Cranberry Syrup	19	20	19	19.3	
Ethyl alcohol 96°	40	35	35	36.7	
Calendula tincture	38	31	40	36.3	
Thyme Extract	30	27	23	26.7	
Balsamic Vinegar	32	22	25	26.3	

Natural antibiotic alternatives, are they worth a shot?

Results

Antibiotic sensitivity testing Zone of inhibition (mm).

Antibiotic:	Nasal swab 3
Cefalexin	30
Cefotaxim	17
Nalidixic acid	24
Vancomycin	21
Sulfamethoxazole	32



Natural antibiotic alternatives, are they worth a shot?

Conclusions

- 🦠 Nine natural antibiotics were discovered to be effective against the pathogen *Escherichia coli*.
- 🦠 Most natural antibiotics were discovered to be more effective against bacterial flora than *Escherichia coli*.
- 🦠 The effectivity of thyme and Calendula tincture could be due to them containing alcohol.





Thank you 

Any questions are welcome.

