How Effective Are Natural Antimicrobials At Inhibiting The Growth Of Bacteria?

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BACKGROUND

01

BACKGROUND INFO

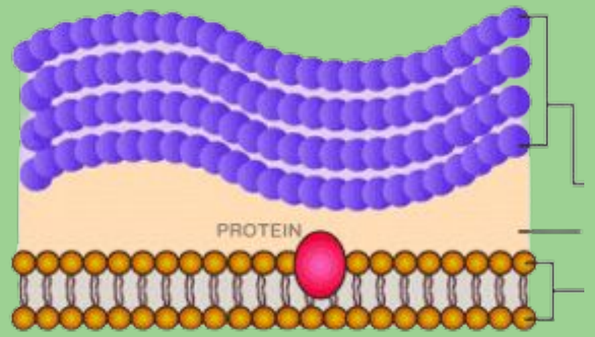
Our Aims:

- Investigate how effective different natural antimicrobial agents are at inhibiting the growth of bacteria
- Come to conclusive results on the best methods to keep surfaces and foodstuffs sanitary and safe
- Improve our understanding on the antimicrobial properties of natural compounds

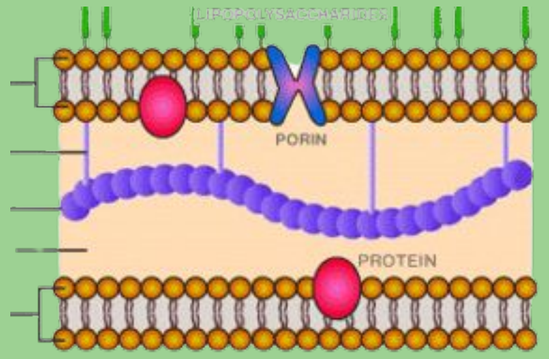
Opportunities:

- Addressing resistance of bacteria to pharmaceutical antibiotics
- Finding sustainable sources of antibiotics
- Exploring alternative treatments for bacterial infections that can decrease side-effects and complications

WHY LACTOBACILLUS?



Gram Positive (*Lactobacillus acidophilus)*



Gram Negative (*Escheria coli*)

GOAL:

SUSTAINABILITY

Addressing:

Toxic chemicals

Wasteful production

Impacts on health

Cost-effectiveness

ANTIMICROBIALS

Garlic

Allicin - interferes with enzymes

Clove

Eugenol - affects membrane permeability and cell growth

Orange Peel

Lime Peel

Flavonoids - denature proteins and inhibit cell growth

Saponin - affects membrane permeability

White Vinegar

Acetic acid - unfavourable pH

Honey

High sugar content- dehydration of cells

Oregano

Thymol and carvacrol - disrupts cell membrane and wall

Lemongrass

Citral - changes ATP concentration, cell membrane and pH

METHOD

02

OUR METHOD

Extract Making

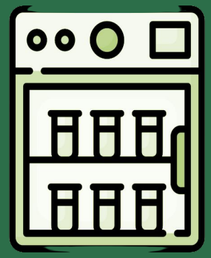
Dry ingredients cut or crushed with pestle and mortar

5g of antimicrobial + 15g of boiled water

Streaking

Lactobacillus acidophilus streaked onto agar gel

Filter paper soaked in antimicrobial in the centre



Incubation

Petri dishes placed in incubator set at 37˚C for 24 hours

Data Collection

Area of bacterial growth measured and recorded

SAFETY & ETHICAL CONSIDERATIONS

PATHOGENIC BACTERIA CULTURES

Problem: Slim chance of this bacterium causing illness and spareding

Solutions:

- Treat all microorganisms as if they are pathogens

- Severely immunocompromised/ill students should **consult with a medical professional**
- Any samples or solutions used that may be hazardous was **labelled** with a clearly visible and sufficiently detailed warning
- All waste in contact with bacteria should be **discarded into a biohazard bag**

GENERAL LAB SAFETY

Problem: Broken glassware and equipment can cause injury

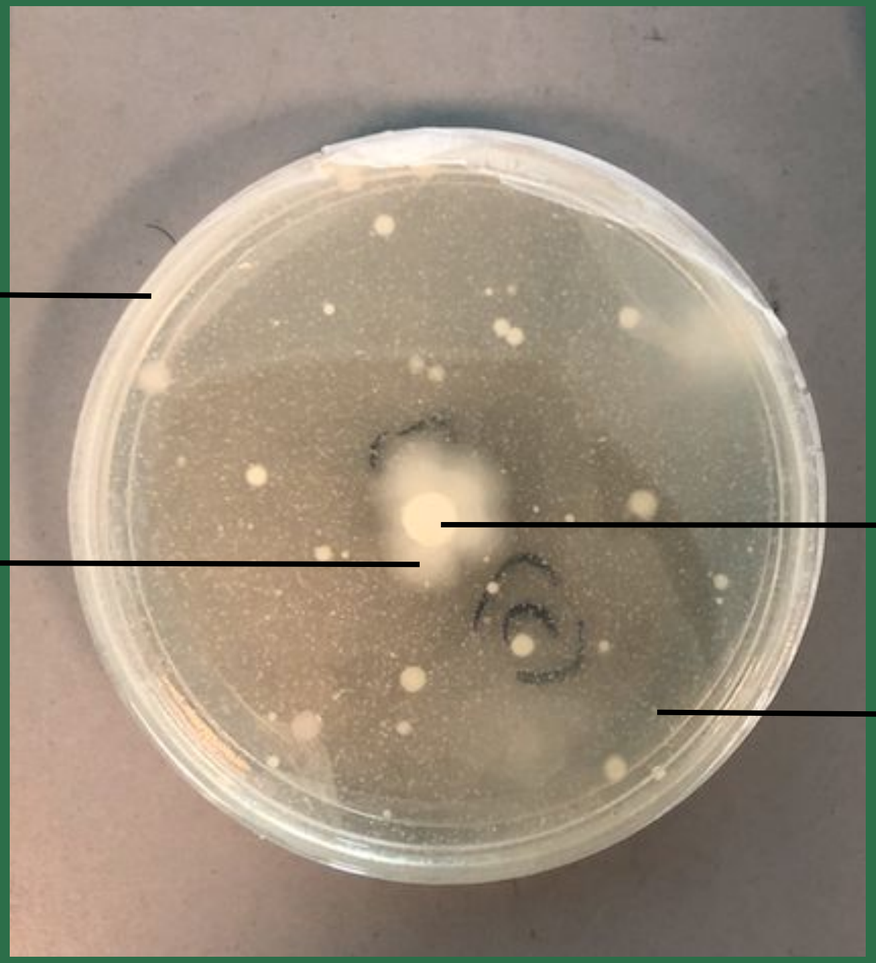
Solutions:

- Place all equipment on flat, level surfaces
- Ensure that all broken glassware is discarded into a properly labelled waste bag

Problem: Hazardous chemicals

Solution:

- Lab coats should be worn to protect skin and clothing from being completely exposed to bacteria and any spills.
- Disposable latex gloves should be worn to limit contact with chemicals and bacteria.


petri dish
bacterial growth
filter paper with antimicrobial
agar gel

THE SETUP

03

CONCLUSION

Natural antibiotic	Width (mm)				Length (mm)				Average diameter (mm)				Area (mm^2)			
	T1	T2	T3	x̄	T1	T2	T3	x̄	T1	T2	T3	x̄	T1	T2	T3	x̄
Garlic	18	9	9	12	10	7	8	8	-	8	9	9	180	50	64	98
White vinegar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Honey	7	8	12	9	7	7	14	9	7	8	13	9	39	50	133	74
Clove	6	7	7	7	5	7	7	6	6	7	7	7	28	38	38	35
Oregano	11	40	12	21	11	24	12	16	11	-	12	8	95	960	113	389
Orange peel	19	0	13	11	17	0	12	10	18	0	13	10	254	0	133	129
Lime peel	55	23	47	42	22	18	27	22	-	-	-	-	1210	414	1269	964
Lemongrass	18	21	21	20	20	23	20	21	19	22	21	31	284	380	346	337
CONTROL	16				17				17				227			

Conclusion:

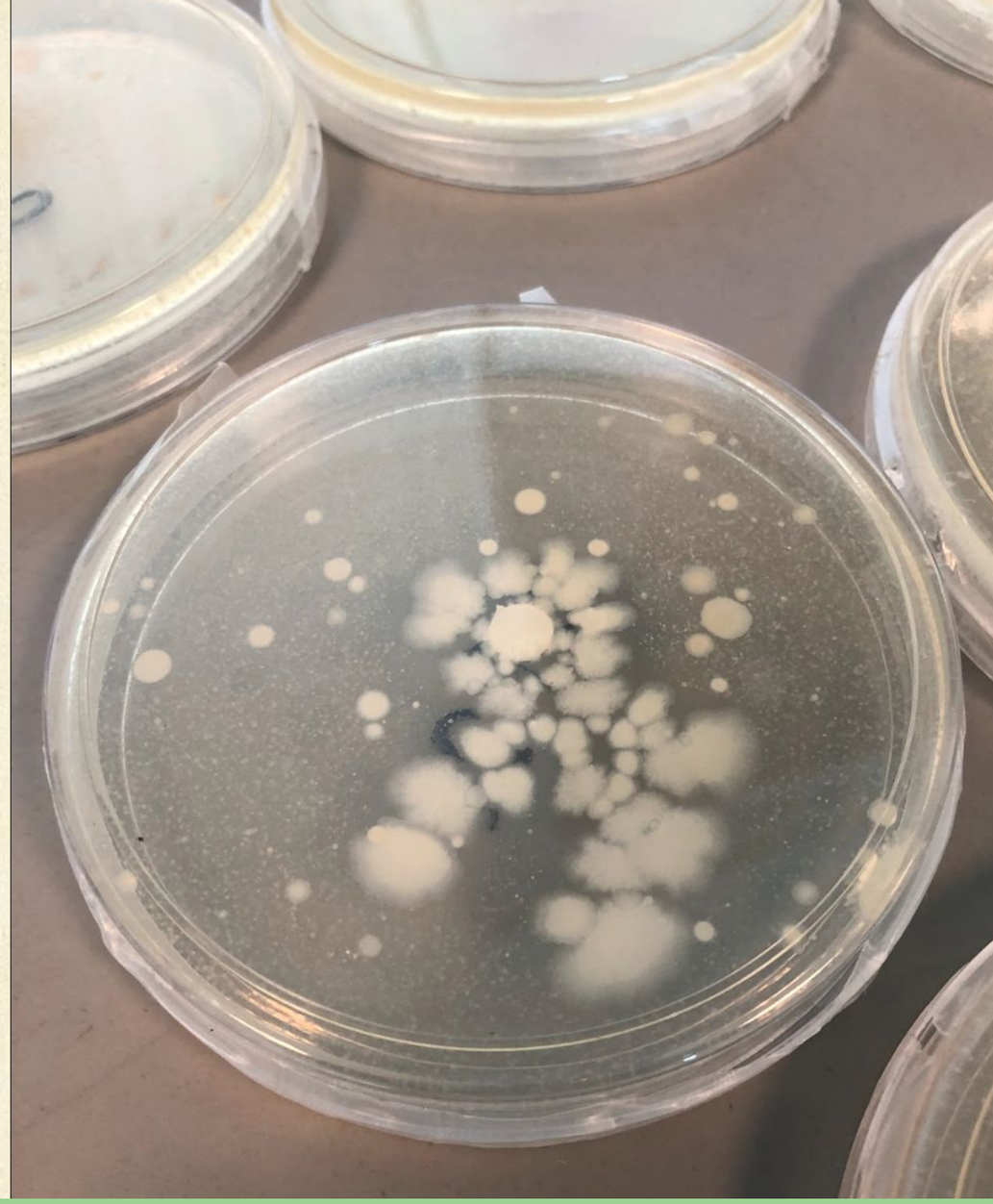
White vinegar inhibits the growth of *Lactobacillus acidophilus* most effectively.

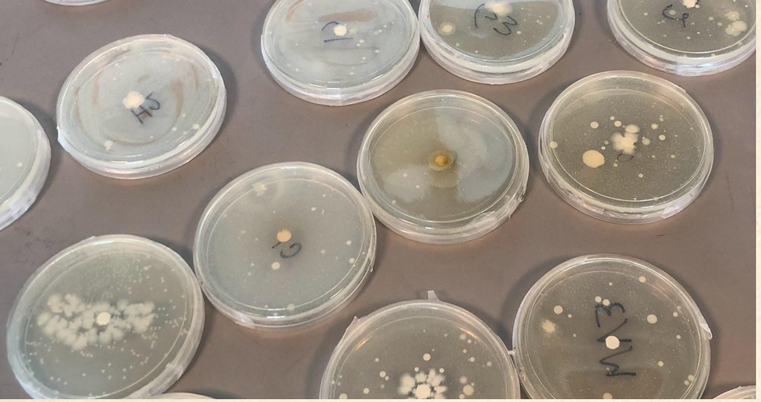
Implications

- Can prevent growth of other bacteria (E. coli, Salmonella etc.)
- Gram negative bacteria can be more susceptible (thinner walls)
- Bacteria are inhibited best by low pH
- Can interfere with good bacteria/probiotics

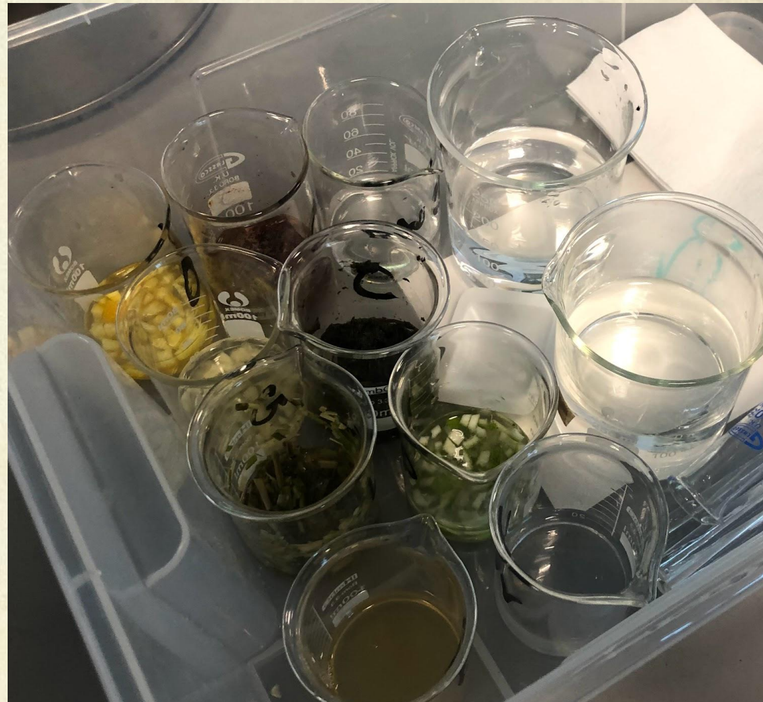
Sources of Error:

- Shape of the bacteria colonies:
  - Inorganic shapes
  - Difficulty measuring accurate area
- Poor sealing of petri dishes:
  - Contamination of other microorganisms
  - Competition for resources affecting bacteria's growth






Team 1



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THANK YOU FOR YOUR ATTENTION!