5. Disinfectants

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IYNT 2020

Prepare sterile culture dishes and investigate the growth of door handle bacteria and other common microorganisms. Investigate how various disinfectants, such as antibacterial soap, affect the bacteria.

Outline

01 Theoretical part

- Bacteria
- Most common bacteria
- Disinfection
- Mode of action

02 Experimental part

- Structure
- Experiment
- Final results
- Analyzing the colonies
- Disinfectants

03 Final part

- Interpretation of data
- Possible errors

Theoretical part

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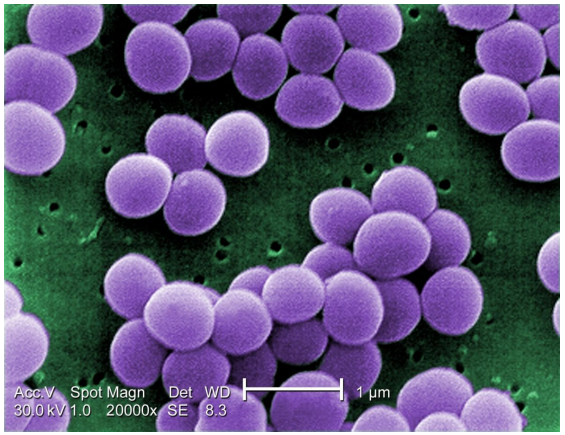
What are bacteria?

= bacteria, also called germs, are microscopic organisms not visible with the naked eye.

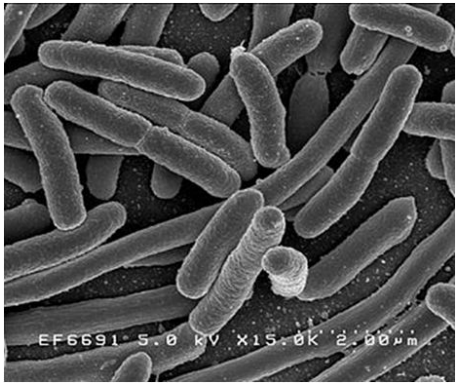


Types of bacteria

Bacteria can be aerobic, anaerobic, or facultative anaerobes.

Bacillus - aerobic

Clostridium - anaerobic

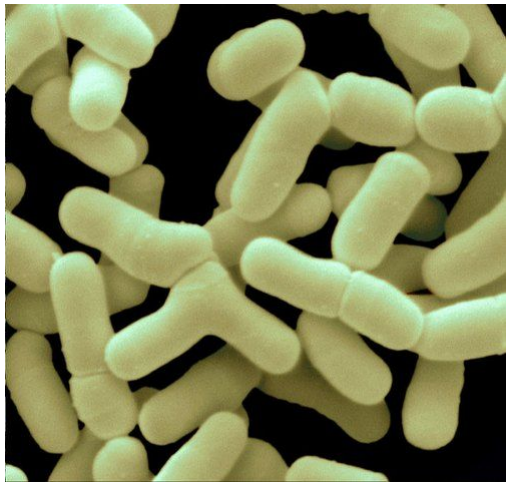


E. coli - facultative anaerobes

Good vs bad bacteria

Good bacteria:

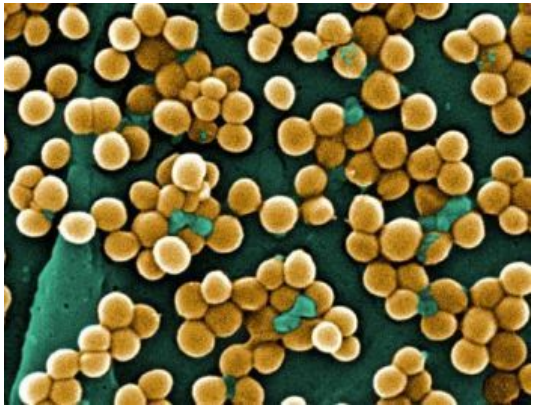
- some bacteria are good for us,
- decompose food and keep us healthy.



Bifidobacteria

Bad bacteria:

- release toxins
- can cause diseases and illnesses



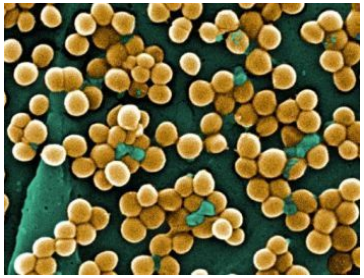
Staphylococcus

Most common bacteria & microorganisms

1. Staphylococcus

-can produce various diseases

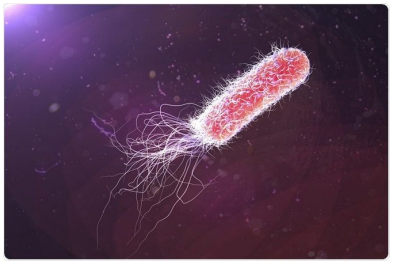
-exists virtually everywhere.



2. Pseudomonas

-opportunistic pathogen

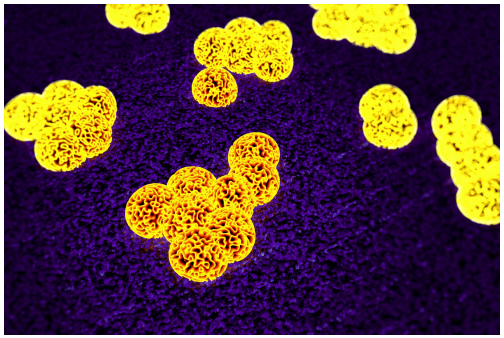
-typically attacks persons with compromised immune systems



3. Micrococcus

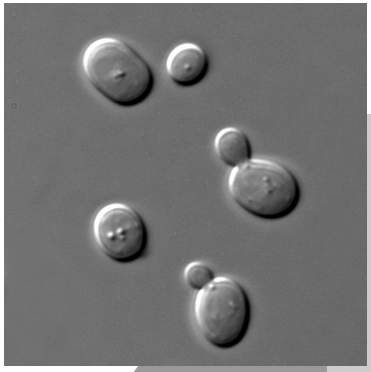
-opportunistic pathogen,

-persons with compromised immune systems.



4. Yeast

- usually a harmless organism
- member of fungus kingdom



Disinfection

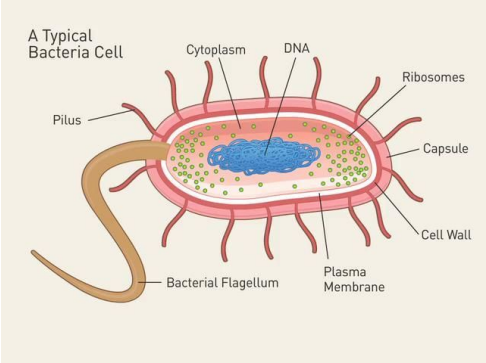
To disinfect = to destroy or prevent the growth of disease-carrying microorganisms.

Mode of action

1. Action on the external membrane of the bacterial wall
2. Action on the bacterial wall
3. Action on the cytoplasmic membrane
4. Action on the cytoplasm and nucleus
5. Destroying the DNA

Disinfectants

= are complex formulations of active molecules.



Staphylococcus

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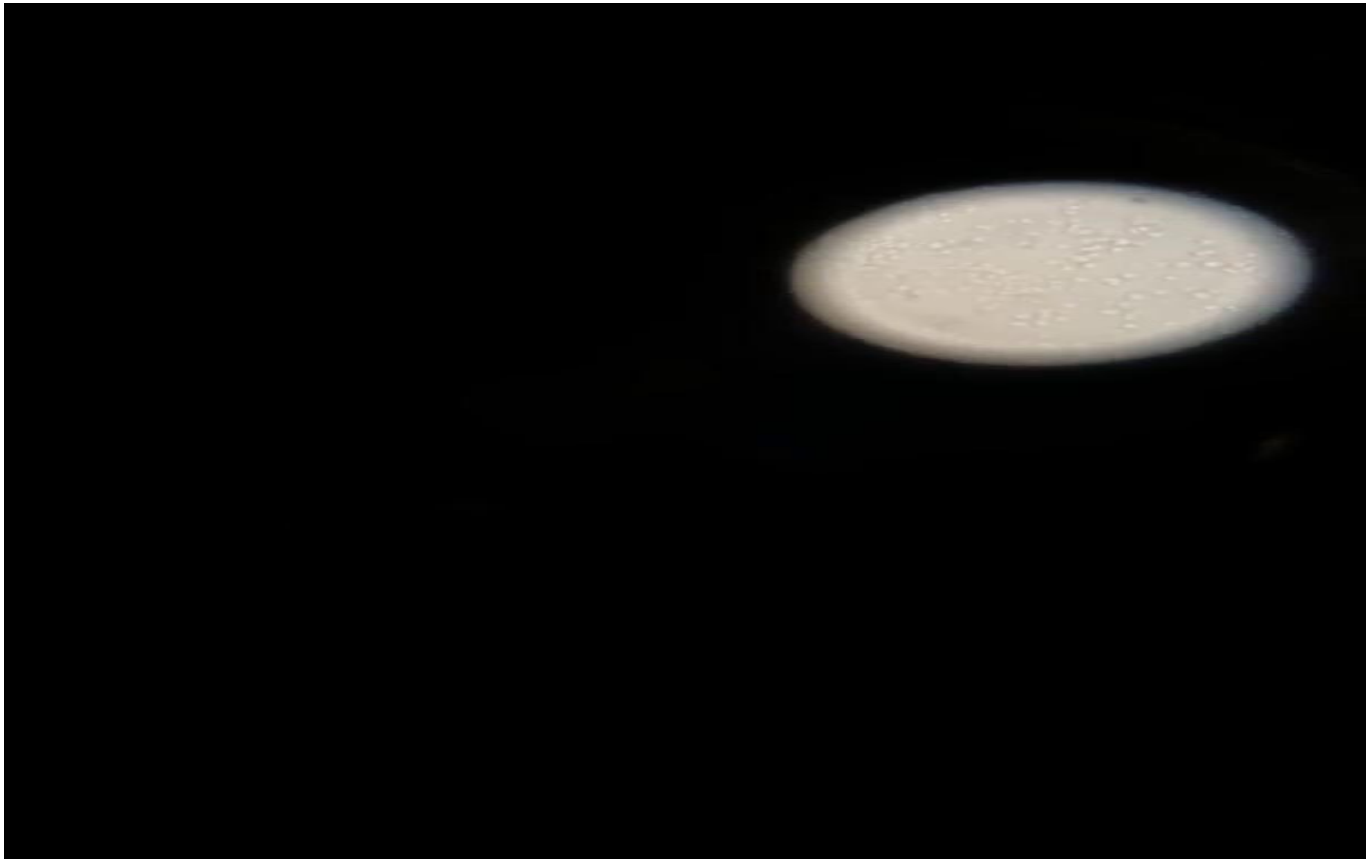
Chlorine solution



Experimental part

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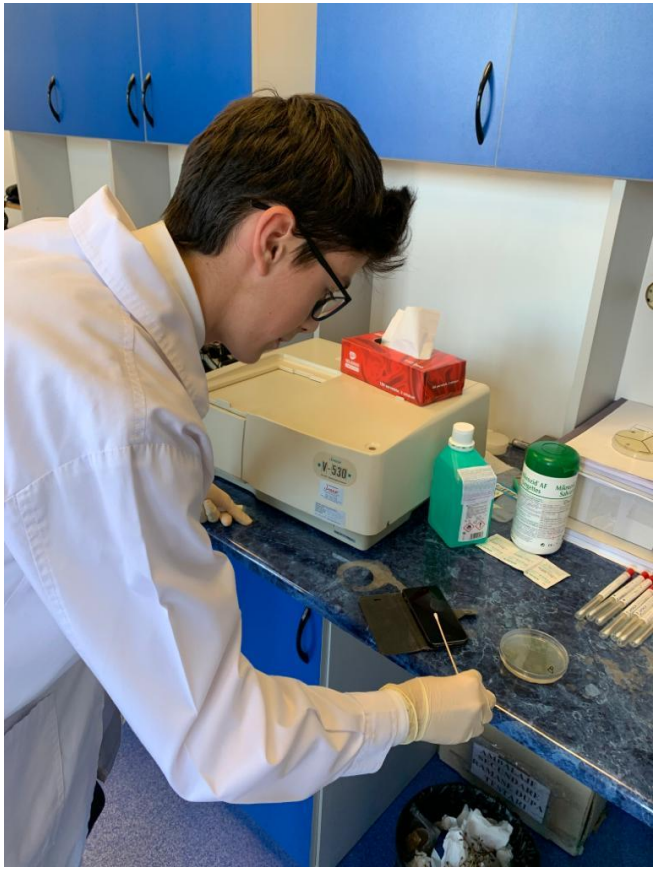
Structure

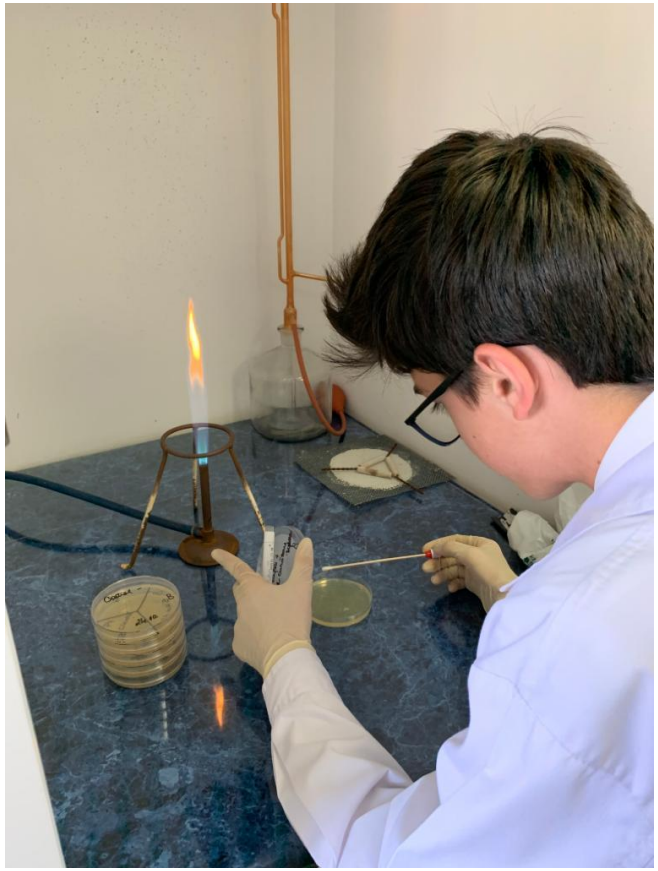
1. take samples from various objects
2. examine the bacteria and the colonies
3. use different disinfectants
4. compare the results

Taking samples

- Petri dishes
- Cotton swabs
- Autoclave

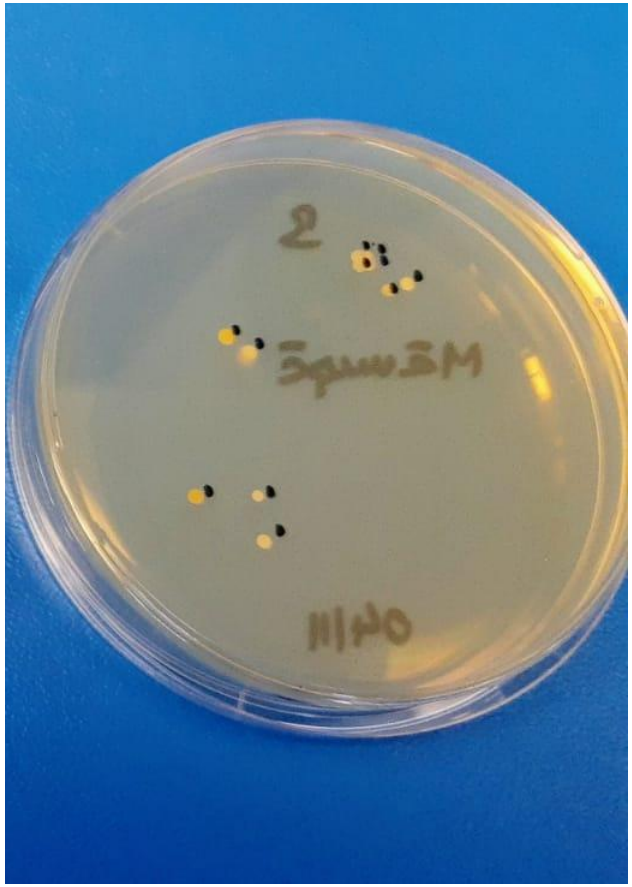
Inoculate





Incubate

Final results - glove

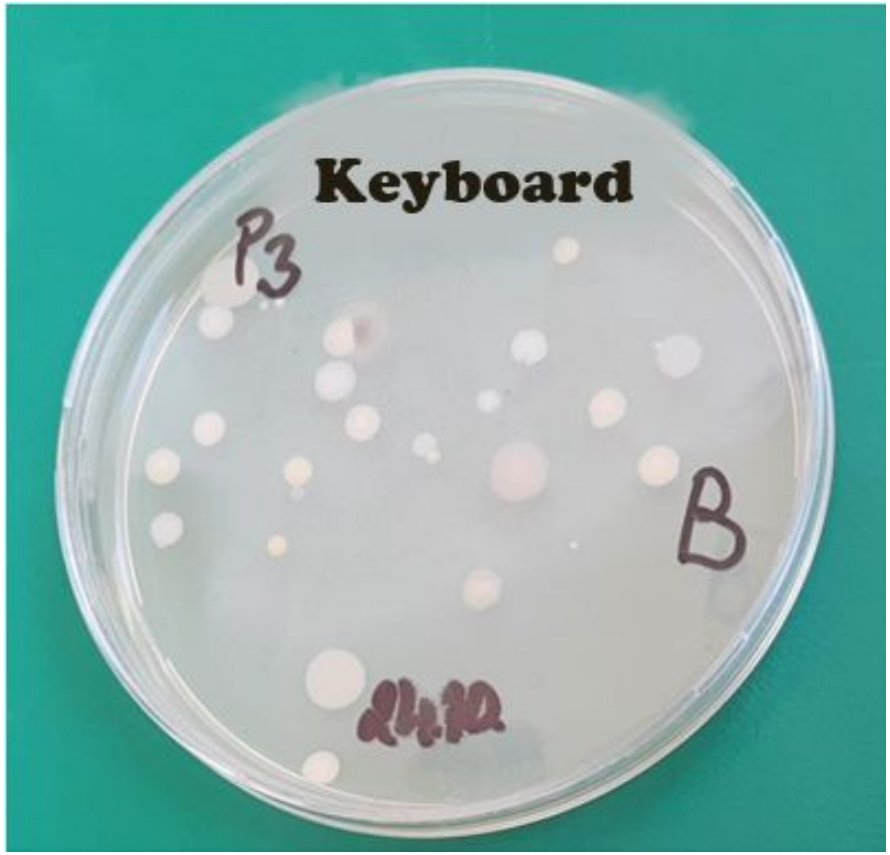


11 pinpoint colonies

Final results - door handle

13 pinpoint colonies + 3 big irregular colonies

Final results - keyboard



21 small & medium colonies

Final results - phone

4 pinpoint colonies

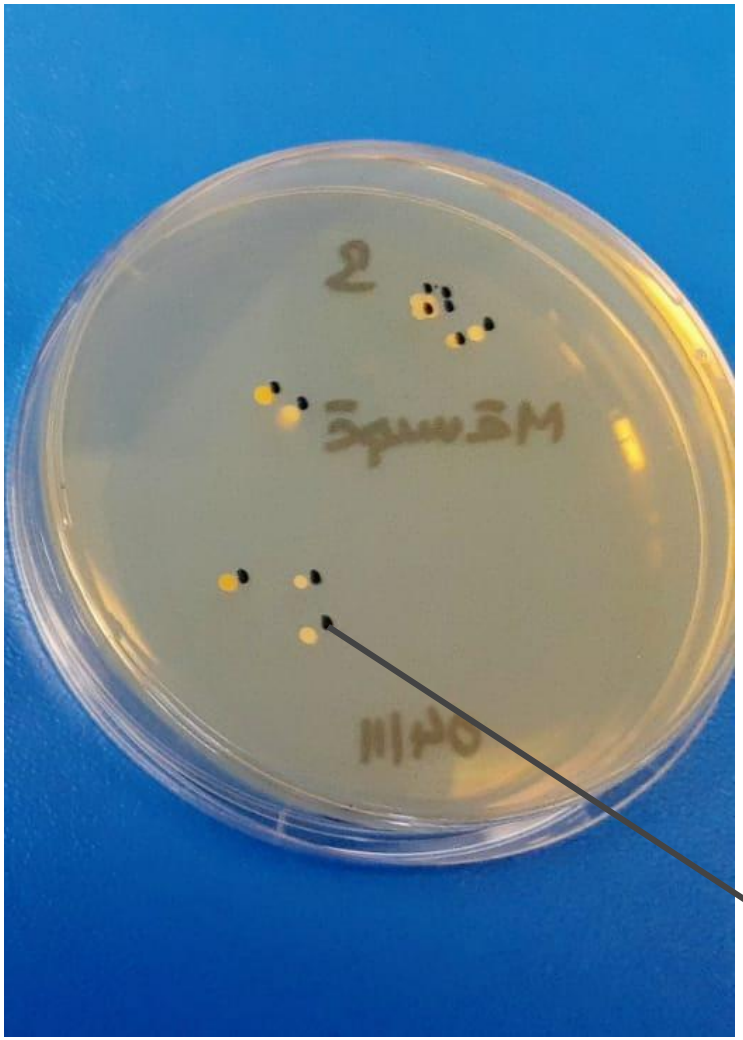
Analyzing the colonies

A colony = a visible mass of microorganisms all originating from a single mother cell.

We will examine:

1. Size
2. Shape
3. Surface
4. Color
5. Elevation
6. Opacity

Glove

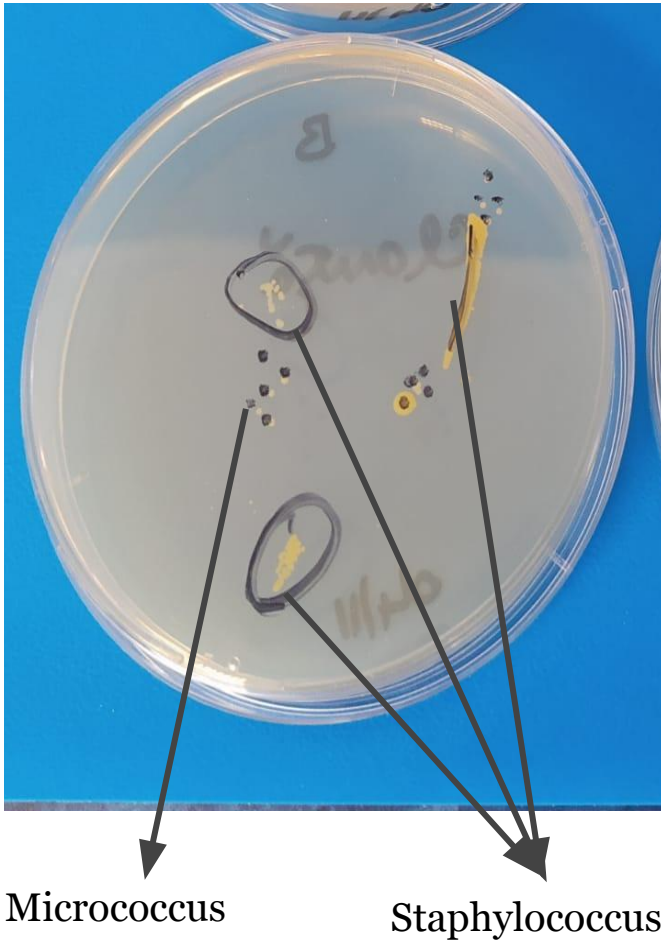


Micrococcus

1. Size : pinpoint
2. Shape : circular
3. Surface : smooth
4. Color : yellow
5. Elevation : convex
6. Opacity : opaque

Micrococcus

Door handle



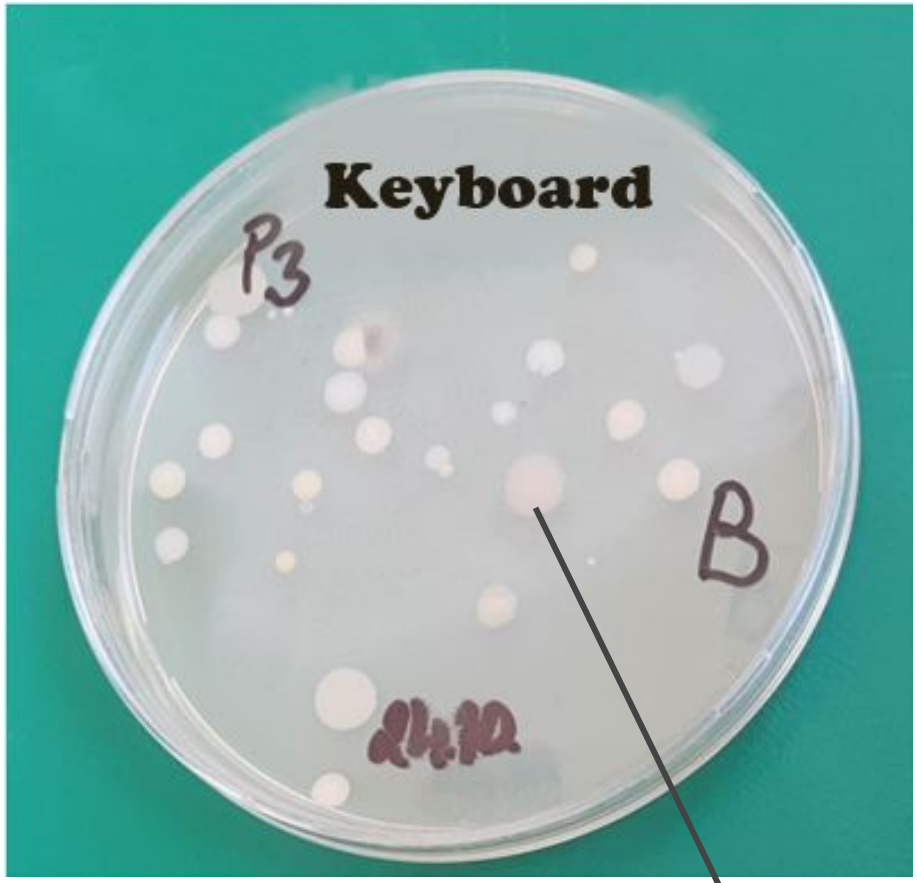
1. Size : pinpoint
2. Shape : circular
3. Surface : smooth
4. Color : yellow
5. Elevation : convex
6. Opacity : opaque

Micrococcus

1. Size : medium & large
2. Shape : irregular
3. Surface : smooth
4. Color : yellow
5. Elevation : flat
6. Opacity : opaque

Staphylococcus

Keyboard



Pseudomonas

1. Size : small & medium
2. Shape : circular
3. Surface : smooth
4. Color : white
5. Elevation : flat
6. Opacity : opaque

Pseudomonas

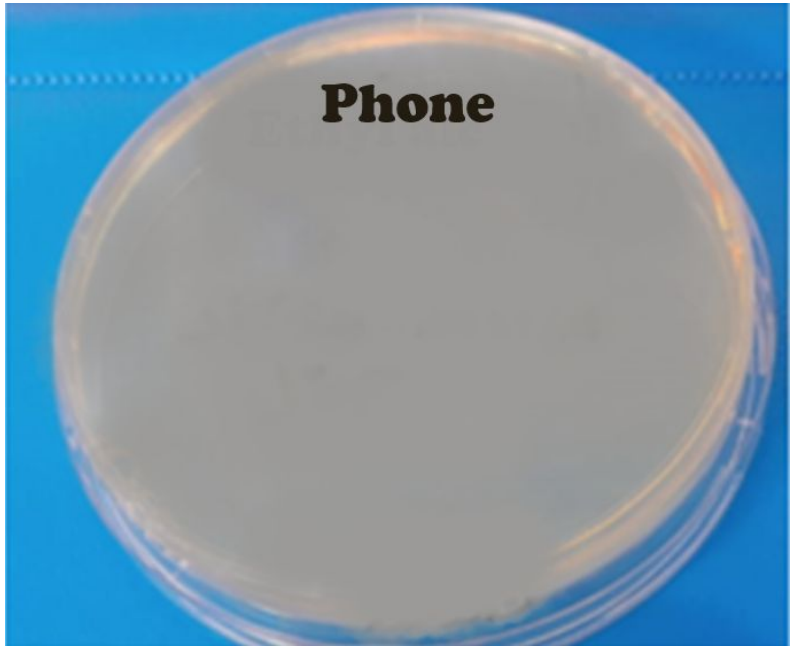
Phone

Yeast

1. Size : pinpoint
2. Shape : circular
3. Surface : smooth
4. Color : white
5. Elevation : convex
6. Opacity : opaque

Yeast

Ethyl alcohol - 70%



Before : 4 colonies
After : 0 colonies
Killing percentage : 100%

Before : 13 + 3 colonies
After : 4 colonies
Killing percentage : 75%

Antibacterial soap - 0.15% triclosan

Before : 21 colonies
After : 4 colonies
Killing percentage : 81%

Before : 11 colonies
After : 2 colonies
Killing percentage : 82%

Chlorine - 1 mg/l

Before : 13 + 3 colonies
After : 0 colonies
Killing percentage : 100%

Before : 21 colonies
After : 0 colonies
Killing percentage : 100%

Comparison between the disinfectants

Ethyl alcohol	Antibacterial soap	Chlorine
- penetrates the cell wall - destroys the cell wall - dissolves the glucans	- impairs the production of lipids - cell can no longer feed - bacteria will die	- replace with a chlorine atom - the entire structure changes - bacteria will self-destruct
- cell wall is resistant - ethyl alcohol will not dissolve the glucans	- if only one lipid is not killed - the bacteria will survive	- most effective - it just replaces the enzyme with a chlorine atom

Final part

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Interpretation of data

- Some disinfectants kill a better percent of bacteria then the others.
- The best disinfectant that I tried are the ethyl alcohol and the chlorine.
- The antibacterial soap is not very efficient because of the small concentration of triclosan.
- The dirtiest spot that I examined are the keyboard and the door handle.

Possible errors

- The dishes are not completely sterile.
- The disinfectants are not 100% pure.
- The handling was not perfect.
- There could have been very small colonies of bacteria that I could not notice with my naked-eye.

Thank you for your attention!

References

- https://en.wikipedia.org/wiki/Bacteria
- https://www.livescience.com/51641-bacteria.html
- https://micro.magnet.fsu.edu/cells/bacteriacell.html
- https://microbiologyonline.org/about-microbiology/introducing-microbes/bacteria
- https://www.futurity.org/dust-bacteria-triclosan-1947292/
- https://www.pharmawareness.com/what-is-disinfectants-and-mode-of-action-of-disinfection-solution/