

THE ANTIBACTERIAL EFFECTS OF *ALLIUM SATIVUM* (GARLIC) ON ENVIRONMENTAL BACTERIA

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- ▶ Examine the antibacterial properties of garlic on environmental bacteria
- ▶ Determine whether or not garlic's antibacterial properties will be effective against environmental bacteria

GOALS OF THE EXPERIMENT

- ▶ It was hypothesized that the garlic extract would prevent the growth of the bacteria

HYPOTHESIS

- ▶ Provide a natural antibacterial agent
- ▶ Raise awareness for alternative and organic antibacterial agents

IMPORTANCE

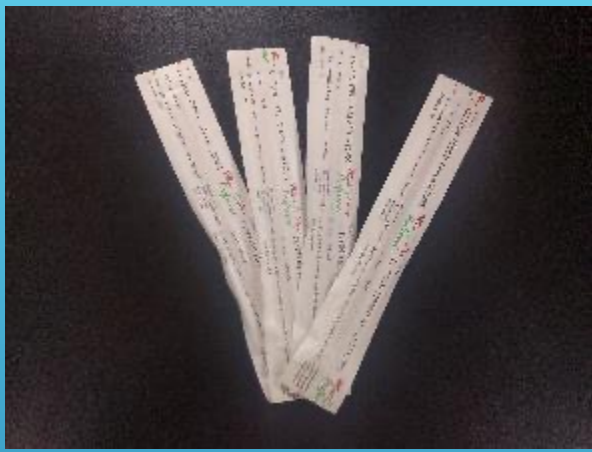


ALLIUM SATIVUM

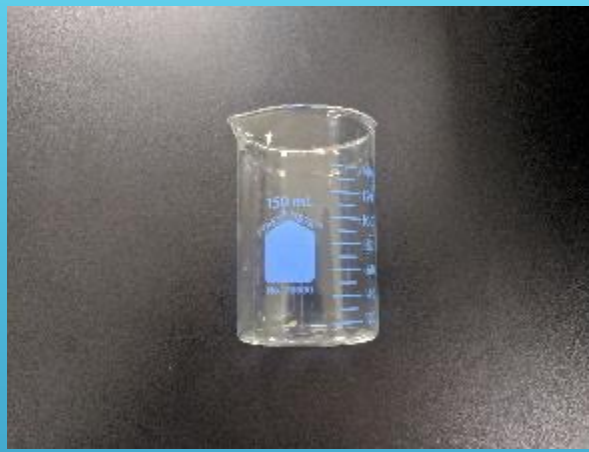
- ▶ Commonly known as “Garlic”
- ▶ Native to Central Asia, but can be found around the world
- ▶ Known Uses:
 - ▶ Food and Drinks
 - ▶ Traditional And Modern Medicine
 - ▶ Pest Control

- ▶ There is a wide variety of bacteria that can be found all over the environment.
- ▶ Some have beneficial effects that help aid our environment and body; such as, breaking down organic substances in soil, helping with the process of digestion, function of our immune system
- ▶ However, there are also harmful types present that can cause diseases; such as, staph infections, pneumonia, strep throat, etc.

ENVIRONMENTAL BACTERIA



Cotton-Tipped
Applicators



150ml Beaker



Mortar & Pestle



Gloves



1ml Pipette



4X4 Gauze Sponge

MATERIALS



1. Used sterile cotton tipped applicators to swab sink
2. Used the spread method to smear the contents of the swab onto agars
3. Put agars into Incubator Shaker for 48 Hours at 37°C

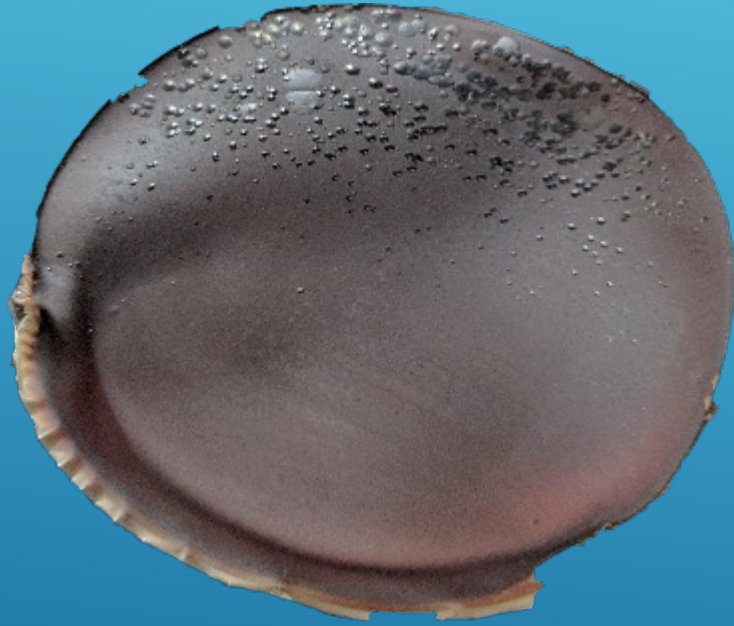
GROWING THE BACTERIA

1. Bought and peeled ~35g of fresh garlic
2. Used a sterile mortar and pestle to crush the garlic
3. Mixed in 2ml of distilled water with the crushed garlic
4. Put garlic into sterile gauze sponge
5. Squeezed the garlic extract into a 150ml sterile beaker
6. Used a sterile 1ml pipette to apply 3 drops of the extract to smeared agars

THE GARLIC EXTRACT



Without The Extract
(Control)



With The Extract
(Experimental)

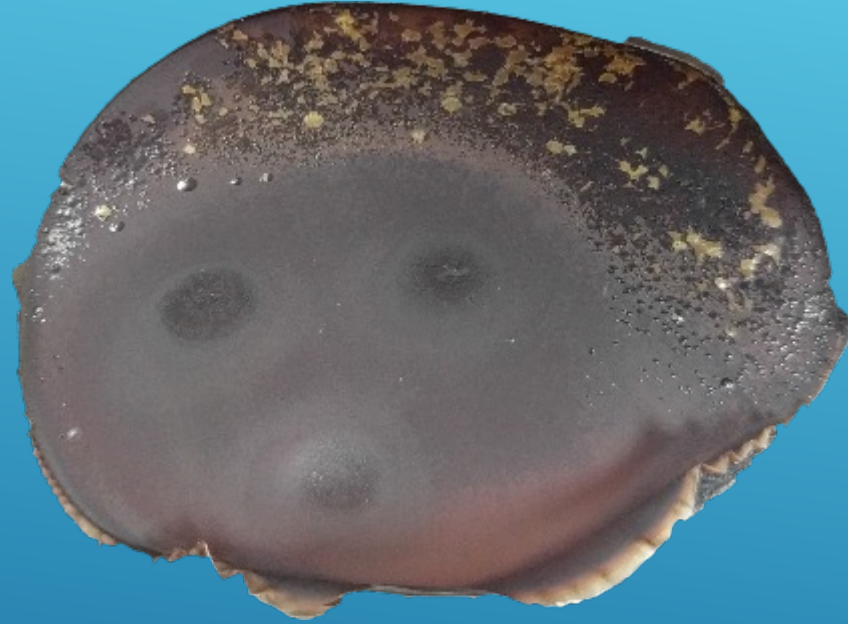


RESULTS (2 DAYS)

Without The Extract
(Control)

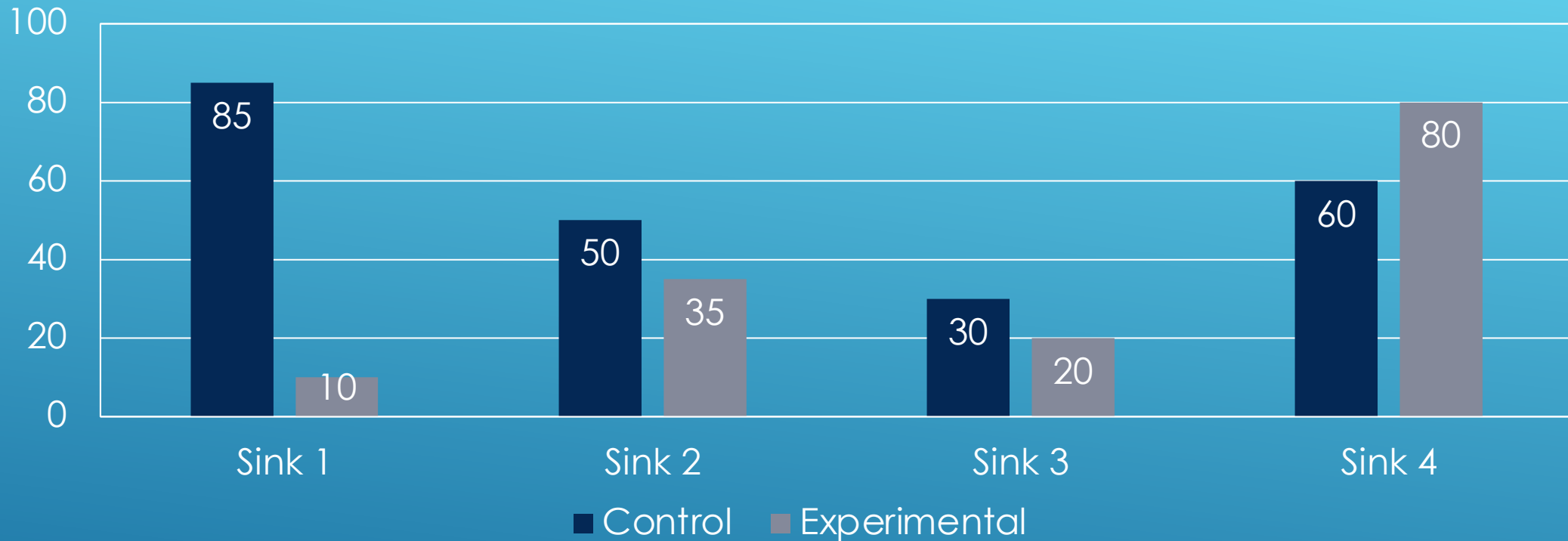


With The Extract
(Experimental)



RESULTS (7 DAYS)

Bacterial Growth After 7 Days



* Numbers are an estimate based on observation of the agar's surface area

RESULTS

- ▶ On the controlled agar the bacteria didn't have a confluent growth
- ▶ On the experimental agar the bacteria grew around the drops of garlic and had a more confluent growth

RESULTS

- ▶ After careful observations and repeated tests, we can conclude that we reject our hypothesis based on inconclusive results
- ▶ The results were inconclusive because of the irregular growth on the controlled agar and insufficient information from the controlled agar
- ▶ However, it is suggestive that the garlic extract does have an antibacterial effect on environmental bacterial
- ▶ More tests should be conducted to solidify this claim

CONCLUSION

- ▶ Agar diffusion test
- ▶ Different concentrations of extract
- ▶ Use freshly made agars
- ▶ Run tests in triplicate
- ▶ Use a better control method; e.g., apply drops of water

FUTURE EXPERIMENTS

- ▶ Arya, Niharika. "Bacteria That are Helpful to Humans and the Environment." *Buzzle*. Buzzle.com, 22 Aug. 2016. Web. 01 Aug. 2017.
- ▶ Borade, Gaynor. "Diseases Caused by Bacteria." *Buzzle*. Buzzle.com, 04 Aug. 2016. Web. 01 Aug. 2017.
- ▶ Ohta, Rie, Norihiko Yamada, Hisae Kaneko, Keiko Ishikawa, Hiroyuki Fukuda, Tsuchiyoshi Fujino, and Atsushi Suzuki. "In Vitro Inhibition of the Growth of *Helicobacter Pylori* by Oil-Macerated Garlic Constituents." *Antimicrobial Agents and Chemotherapy*. American Society for Microbiology, July 1999. Web. 5 July 2017.
- ▶ Sanders, Helen. "Is This Vegetable Really A Good Antibiotic?" *Health Ambition*. N.p., 20 June 2016. Web. 27 June 2017.
- ▶ Smith, Grace. "Kitchen Bacteria - Where It Grows and How to Fight It." *Food Safety First*. N.p., 22 Sept. 2016. Web. 3 July 2017.
- ▶ "E.coli (Escherichia Coli)." *Centers for Disease Control and Prevention*. Centers for Disease Control and Prevention, 03 Mar. 2017. Web. 3 July 2017.
- ▶ "GARLIC: Uses, Side Effects, Interactions and Warnings." *WebMD*. WebMD, n.d. Web. 27 June 2017.
- ▶ "Northern Mariana Islands ." *Northern Mariana Islands | Data*. N.p., n.d. Web. 21 July 2017.

BIBLIOGRAPHY

- ▶ Mr. Johnny Aldan
- ▶ Dr. George Hui
- ▶ Northern Marianas College
- ▶ Commonwealth Healthcare Corporation
- ▶ CNMI Public School System

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