Effects of Common Foods on Bacteria in Water

Group ID: 1-030

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Background Information

www.hydrogenhealthwater.com

- Water-borne diseases are any illness caused by drinking water contaminated by faeces, which contain pathogenic microorganisms.
- Over the past decades, outbreaks of water-borne diseases have been increasing, and they continue do so today.

Reference: A review of disinfection practices and issues. N.p., n.d. Web. 19 Feb 2012. <http://www.waterandhealth.org/drinkingwater/wp.html>

Background Information

www.shalinikagal.hubpages.com

- 3.575 million people die each year from water-related diseases
  - Water plays an essential role in the transmission of diseases.

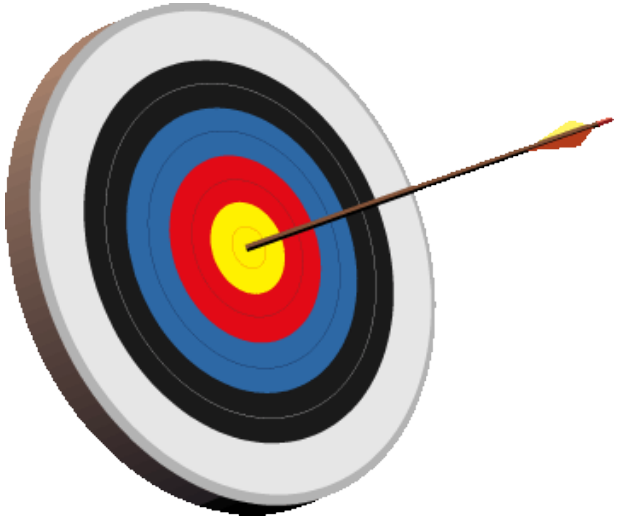
Reference: A review of disinfection practices and issues. N.p., n.d. Web. 19 Feb 2012. <http://www.waterandhealth.org/drinkingwater/wp.html>

Diseases	Estimated Morbidity (episodes per year or people infected)	Estimated Mortality (deaths per year)	Relationship of Disease to Water and Sanitation Conditions
Diarrheal diseases	1,000,000,000	2,200,000 to 5,000,000	Strongly related to unsanitary excreta disposal, poor personal and domestic hygiene, unsafe drinking water
Intestinal helminths	1,500,000,000 (people infected)	100,000	Strongly related to unsanitary excreta disposal, poor personal and domestic hygiene
Schistosomiasis	200,000,000 (people infected)	200,000	Strongly related to unsanitary excreta disposal and absence of nearby sources of safe water
Dracunculiasis	150,000 (in 1996)	---	Strongly related to unsafe drinking water
Trachoma	150,000,000 (active cases)	---	Strongly related to lack of face washing, often due to absence of nearby sources of safe water
Poliomyelitis	114,000	---	Related to unsanitary excreta disposal, poor personal and domestic hygiene, unsafe drinking water
Trypanosomiasis	275,000	130,000	Related to the absence of nearby sources of safe water

Peter H.Gleick, 2002, 15th August, Pacific Institute Research Report

Rationale & Objectives

- Because of this, we were inspired to find out more on getting rid of the bacteria in water.
- We intend to find common food substances that are anti-bacteria to make the water cleaner for consumption.



www.paranormalpointofview.blogspot.com

Food Sources

1. Lime
2. Coffee grounds
3. Onion
4. Garlic

www.teachengineering.org

www.teachengineering.org

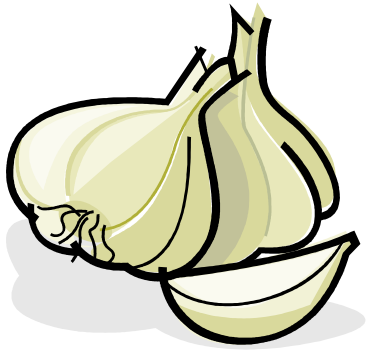
Food Source 1: Lime

- Lime contains unique flavonoid compounds
- It has been found to be protective against the transmission of cholera, and to be effective against yeast
- Antibacterial properties of acidic lime extracts: average amount of viruses and bacteria in waste water had drastic drops of up to 96%

Reference: W.O.K Grabow, Nerrie C. Basson , 1997. National Institute for Water Research of the Council of Scientific and Industrial research

www.chemical-industries.com

Food Source 2: Garlic



www.clipartreview.com

- Contains a disulfide, Ajeone, prevents infections with yeast *Candida albicans*
- Crushed garlics prevent infection of *Pseudomonas aeruginosa* in burn patients
- Garlic extract, (*Allicin*) was once tested on carrot seeds infested with *Alternaria*. For the control, 12/100 seeds grew. For the samples treated with *Allicin*, 47/100 seeds grew.

Reference: 1) The world, 2011, 1 1
2) Alan.J.Sulsarenko, Anant Patel, Daniela Portz, 2007, 27th September

Food Source 3: Coffee Grounds

- Coffee grounds has been tested for antibacterial effects on *staphylococcus*, *enterobacter*, *salmonella* and *E. coli*. (Ramanaviciene, A., Mostovojus, V., Bachmotova, I., & Ramanavicius, A. (2003). Anti-bacterial effect of caffeine on Escherichia coli and Pseudomonas fluorescens. *Acta Medica Lituanica*, *10*(4), 185-188.

- Coffee Grounds was more effective at inhibiting bacterial strains than was the antibiotic ampicillin. (Greenwood, B. 2011, September 29). Retrieved from http://www.livestrong.com/article/545173-does-caffeine-affect-bacteria)

www.clipart-for-free.blogspot.com

Food Source 4: Onion

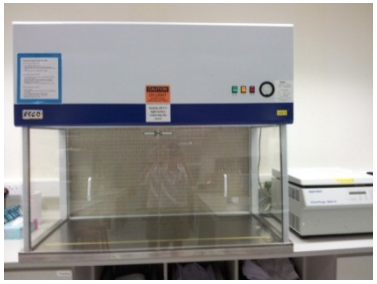
- Onion extracts are found to have high antioxidant capacity.
- *Quercetin was extracted from the onions and separately added to cultures of Bacillus cereus, Staphylococcus aureus, M. luteus*
- *Quercetin* had an inhibitory effect on all the strains of bacteria that were studied.

Jonathan Santas; María Pilar Almajano; The University of Barcelona, Spain, 2010. The International Journal of Food Science and Technology

Hypothesis

Lime extracts have the best anti-bacteria properties

Materials and Apparatus



Laminar Flow Hood

Incubator

Glass Bottles

Petri Dishes

Deionised Water

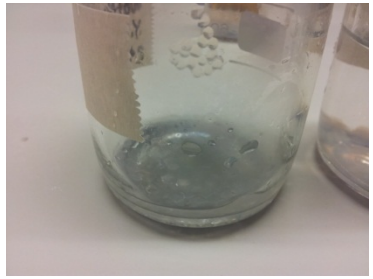
Centrifuge Shaker

Electronic Scale

Syringes

Sterile Agar (Molten Form)

Orbital Shaker



Sodium Alginate (Beads)

Sodium Alginate (Molten Form)

Sterile Paper Discs

Materials and Apparatus


Blender

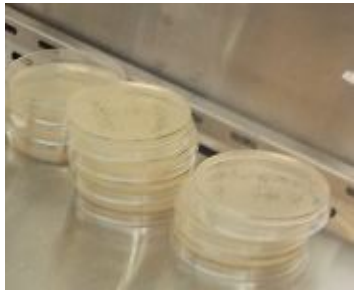

Pipette


Ethanol and Alcohol Burner


Centrifuge Tubes

Sterile Water


Beakers


Nutrient Agar (Plated)


Dropper


Spreader


Filter Membrane

Preparation of food sources

The food is cut into pieces. For garlic and onion, the skin is peeled off. The limes are cut into half.

Garlic, Onion, and Coffee Beans are blended separately. The lime is squeezed to extract the juice. They are then made into 50% extracts.

The blended coffee with water is centrifuged. All the extracts are then filtered to extract any solid residue left in them.

The liquefied food extracts are then frozen

Variables – Preparation of Food Sources

Controlled Variable	Dependent Variables	Independent Variables
Mass of food to grind up	Concentration of food extract	Type of food extract
Volume of water added to food extract		

Zone of Inhibition

Micro-organisms used: *E.coli, M. luetus* and *Yeast*

The bacteria are placed in the centrifuge tube with Nutrient Broth, and placed in the orbital shaker for overnight culture

The bacteria is then swabbed on the agar plates, and food samples are introduced on small paper discs. The bacteria is then left in the incubator to grow overnight

The next day, the agar plates are removed from the incubator. The diameter of the zone of inhibition is then measured and recorded

The food substance which produced the largest zone of inhibition is the best anti-bacteria food

Variables - Zone of Inhibition

Controlled Variable	Dependent Variables	Independent Variables
Time allowed for the bacteria to grow	Diameter of Zone of Inhibition	Type of micro-organism
Temperature which bacteria grows at		Type of food extract

Colony Count

The micro organisms are adjusted to a concentration of 10^7 CFU/ml

The food extracts are then introduced in liquid suspensions

Every 20 minutes, a sample of each mixture is plated and incubated

After overnight incubation, the plates are removed from the incubator. The resultant colony number is then recorded

Variables – Colony Count

Controlled Variable	Dependent Variables	Independent Variables
Amount of liquid suspension plated	The colony left in each agar plate (resultant CFU)	Type of micro-organism & food extract in mixture
Time given for bacteria to grow		

Food Extracts on Water Samples

The water samples taken before are unfrozen. Using a pipette, a fixed amount of each type of water is then introduced onto 5 agar plates each

Each type of food extract, and with a control (sterile water) are introduced on to 3 different agar plates containing different types of water. They are then mixed with the water

The bacteria is then left to grow

After a few days, the plates are removed. The results (amount of bacteria in each plate) are then compared with those done with *E.coli*, *M.luetus* and *Yeast*

Variables - Food Extracts on Water Samples

Controlled Variable	Dependent Variables	Independent Variables
Time allowed for the bacteria to grow	Amount of Bacteria left on the Agar Plate	Type of Water
Amount of micro-organism		Type of micro-organism
Amount of water sample		

General Timeline for Experiments

1. Preparation of Food Extracts
2. Zone of Inhibition
3. Colony Count
4. Food Extract on Water Samples as a Prove of Concept

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The End

Thank you for your time :D