The O_3 vs Disinfectant

The Effect of Ozonated water vs Topical Disinfectant on Bacteria

Abstract

Ozone water is normal water but you take a bubbler and ozonate it which completely sterilizes the water. I believe this because ozone is a well known sterilization implement. I also believe this because ozone oxidizes cells and destroys their cell walls causing cellular rupture. My hypothesis is that If I take ozone treated water and topical disinfectant then ozone would kill the most bacteria. I tested this by ozonating water, then I took my disinfectant and the ozone water and put them inside of a beaker. Then I took 3 sterile disks and soaked them in each liquid. Then I removed those 3 disks out of the ozonated water and disinfectant and placed each of them in a petri dish full of K-12 e coli .After every 5 days I take the E coli out of the incubator and measure the diameter of the zone of inhibition for both the ozonated water and the disinfectant and after 15 days I took the final measurement. The conclusion I have come to states that ozone's zone of inhibition is 0.0 mm and does not do anything to kill or repel the bacteria and the topical disinfectant worked a lot better with the average zone of inhibition being 11.9mm.

Introduction

Ozone is a highly reactive gas compound. (epa.gov, 2023) Ozone is both a natural and man made product that occurs in the earth's upper atmosphere. (epa.gov, 2022) Ozone affects life on Earth in either good or bad ways. (epa.gov, year) Ozone is used for purifying air and drinking water. (cdc.gov, 2022) Ozone water is just water that has been pumped with ozone to completely sterilize the water. Current applications of ozone water are disinfection and cleaning, it can also be used for water therapy and dental use. The purity of the water can make it very useful for a number of reasons.

Antiseptics are chemical substances that slow down or stop the growth of microorganisms. (rxlist.com, 2023) There are two main groups of topical disinfectants, one being washes and one being rubs. (fda.gov, 2023) the goal of a topical disinfectant is to destroy all bacteria that it comes into contact with. (bpac.org, 2021) all disinfectants are classified based on their chemical nature and each class has its own hazards, toxicities and characteristics. (wv.gov, 2023) there are 3 main chemicals that are put into topical disinfectants including alcohol, chlorine and iodine. (nih.gov, year) the most popular brand of topical disinfectant is clorox which is not surprising. The topical disinfectant that I used was Clorox which contains sodium sodium hypochlorite and water, small amounts of sodium chloride, sodium carbonate and sodium hydroxide.

Hypothesis

If ozone treated water and topical disinfectants both soak sterile disks and then are put into petri dishes with bacteria then I believe ozone would kill the most bacteria. I believe this because ozone is a well known sterilization implement. I also believe this because ozone oxidizes cells and destroys their cell walls causing cellular rupture.

Methods

First I started by Ozonating water for 15 minutes. I then took both the ozone and topical disinfectant and put them both in separate beakers. I then put 9 sterile disks in each beaker for long enough for them to absorb the stuff inside the beaker. While I waited for that to happen I spread my K-12 E Coli onto 6 petri dishes 3 labeled ozone and 3 labeled clorox. I then took 3 sterile disks from each beaker and placed them evenly into every petri dish. I placed them into an incubator then measured the zone of inhibition after 5 and 10 days.

Data

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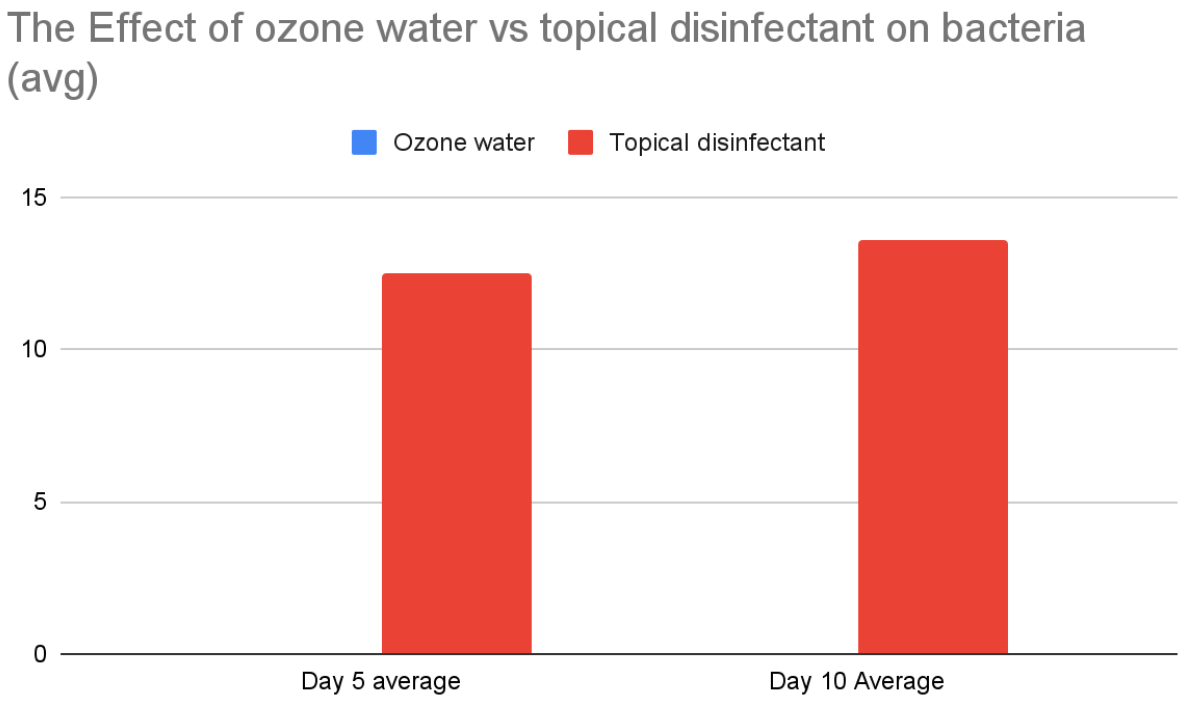
	Ozone (1)	Ozone (2)	Ozone (3)	Clorox (1)	Clorox (2)	Clorox (3)
Day 5	0mm	0mm	0mm	12mm	12mm	11mm
Day 5	0mm	0mm	0mm	14mm	10mm	12mm
Day 5	0mm	0mm	0mm	14mm	15mm	11mm
Day 10	0mm	0mm	0mm	10mm	11mm	14mm
Day 10	0mm	0mm	0mm	11mm	10mm	12mm
Day 10	0mm	0mm	0mm	12mm	10mm	13mm



Discussion

The results I got are that the ozone water did not work at all and got zero results and the clorox worked much better. The reason that the ozone didn't work is because if ozone water goes unused for more than 20 minutes then that water no longer is aseptic and cannot prevent the growth of bacteria. The clorox worked really well because the ingredients in clorox don't expire if they sit out for a certain amount of time. Another reason why the ozone might not have worked is because I didn't ozonate the water for long enough.

Limitations and future research

Some of the limitations I had was time (2 weeks) . I also had to be able to set up the entire experiment in one after school period. Other than that I had no problems setting up the procedure and didnt have a lot of limitations.

My next logical step would be to use other chemicals such as hydrogen peroxide or other cleaning agents and see how well those would work. I could also test a bigger sample to see how reliant the topical disinfectants actually are.

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