Introduction

Public health is a key factor in ensuring safety and quality of life of a society. Public health services monitor the environmental health to identify and solve problems within the community, diagnose and investigate these problems, and inform the public about these issues. The majority of threats to our health are posed by bacteria. With the expanding population, bacterial contamination is a major issue. This can be spread and transmitted at an alarming rate. Each year, more than 2.5 million people are infected with bacteria resistant to antibiotics. Although there are approximately 30,000 bacteria that have already been identified and investigated, the numbers for newly-found colonies increase every year due to mutations and the variety in strains. There is a need to evaluate the role of disinfection towards finding a strategy for addressing bacterial contamination. This is a focus of this study.

Background

Start of drinking water disinfection was an important public health measure around the turn of the century. Waterborne microbial pathogens remain as a potential threat today, and understanding the importance of disinfection (Akin 1982). Illnesses caused by drinking unsafe water kill millions of people annually throughout the world, especially in developing communities of Asia and Africa. It is advantageous to prevent the diseases before they spread and infect people, a task that can result in increasing numbers of communities that have access to safe drinking water.

Study Area

Over the course of this project, both developing and developed countries will be studied in order to determine what is the most beneficial method of disinfection for each, in consideration to their needs and financial abilities. For developed countries, the United States and Canada will be of main focus. For developing countries, the continent of Africa as a whole will be examined, as most of its countries are considered developing, with poor economic systems.

Methods

<table>
<thead>
<tr>
<th>Type of Country</th>
<th>Preventative Method</th>
<th>Effectiveness &amp; Benefits</th>
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</thead>
<tbody>
<tr>
<td>Developed</td>
<td>Ultraviolet (UV) Disinfection System</td>
<td>Highly effective in inactivating bacteria under proper conditions $\approx$200,000</td>
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<tr>
<td>Developed</td>
<td>Reverse Osmosis and Pulsar Quantum System</td>
<td>Removes pseudomonas, bacteria, protozoa viruses (Salmonella, Shigella, E. coli) $\approx$18,000-$20,000</td>
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<tr>
<td>Developed</td>
<td>Chlorine Treatment</td>
<td>Complete removal of bacterial pathogens in SHW treated water in developing countries $\approx$50</td>
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Specific objectives:
1. To study the role of disinfection on water-borne pathogen populations.
2. To develop strategies for disinfection in developed vs. developed countries.

Hypotheses:
- a. UV-based disinfection is superior to chemical-based disinfection.
- b. Income is an important factor in the choice of treatment infrastructure.

Results and Discussion

In developed countries, a Reverse Osmosis system is most beneficial. Since it has a very high, specific effectiveness, requires minimal maintenance, and has a relatively affordable cost. In developing countries, Chlorine Treatment is most beneficial, as it has a high effectiveness rate, is easy to use, accessible, and has an affordable cost. Additions to this research could consist of implications within schools to teach children in developing countries at a young age how to take preventative measures against waterborne diseases and pathogens. In addition, new methods of disinfection could be made by incorporating the obtained results from my conducted research that make the process of disinfection easier in developing countries. These new methods could potentially merge multiple current methods, for higher effectiveness and stability.

Acknowledgements

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