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RESEARCH ARTICLE

INVESTIGATION OF THE BACTERIA EXTRACTED FROM ERBIL CITY'S SEWAGE WATER AND TREATED WITH CHLORINE

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ABSTRACT

Chlorination is one technique used to treat wastewater; this method is particularly good at eliminating bacteria, viruses, and protozoa. Chlorination is a common treatment method because it is more effective than other methods at eliminating most pathogenic organisms; however, it is also capable of eliminating the majority of other contaminants found in water. Seven bacteria were isolated from the sewage water in the current study, which included 30 sample collections from various locations throughout our city, both before and after the sewage water was treated with chlorine. (*Staph. intermedis, Streptococcus agalactiae, Staph.epidermidis, E.coli, Vibrio,cholera, Klebsiella pneumonia,and Pseudomonas aeruginosa*.) The Vitek 2 system was used in conjunction with macroscopic and microscopic examination to make the diagnosis of those isolated bacteria. The amount of isolated bacteria decreased and some of them were killed after being treated with 10 mg/L of chlorine.

KEYWORDS

sewage water, Vitek 2, bacteria, Chlorination

1. INTRODUCTION

Sewage: The community's water source after being tainted by different uses. According to the sources of generation, waste water is the combination of any possible surface, groundwater, and stormwater as well as the liquid (or water) that carries the wastes that are removed from residences, businesses, and industrial facilities. Sewage is the term for wastes that are transported by water, either in suspension or solution, and are intended to drain from a community. The community uses sewage, also known as waste water flows, as its water source (Zhang, 2010).

The presence of indicator microorganisms indicates that the water has been contaminated by human or other warm-blooded animal excrement. (Moss and Adams, 2000). Fish microflora are greatly impacted by both natural and man-made factors that interact with marine habitats, such as sewage treatment plants, farms, and industries (Miranda and Zemelman, 2001; Hatha et al. 1993)

Water is necessary for life. A sufficient, safe, and easily accessible supply must be available to all. Improving access to pure drinking water can be extremely beneficial to health. Every effort ought to be made to ensure the safest possible drinking water quality (Joáo, 2008).

Microbial waterborne illnesses also affect industrialized nations. In the United States, 7.1 million cases of mild to moderate infections and 560,000 cases of severe waterborne diseases result in an estimated 12,000 deaths annually. (Joáo, 2003).

The purpose of this study is to provide an overview of the literature on pathogen and indicator organism survival and persistence in sewage (Ahmed et al., 2014).

germs discovered in sewage sludge The EPA and others have created lists of various pathogenic bacteria, viruses, protozoa, and parasitic worms that could be found in sewage sludges.Municipal wastes from any major metropolis are likely to contain a wide variety of pathogens from around the globe (David and David, 1993).

Field-degradation of sludge's biological and chemical constituents can yield a range of volatile irritants, such as ammonia, volatile fatty acids, inorganic and organic sulfides, and alkyl amines. These compounds' emissions have the potential to irritate the eyes, mucous membranes, and respiratory systems, which could reduce the susceptibility of the host (David and David , 2000).

2. MATERIAL AND METHODS

Using the serial dilution method, thirty samples of treated and raw sewage water were obtained from different locations (5-Hasarok, Rozhhalat, Mamostaian, Bahrka, Galawezh, Roshinberi, Mantkawa, etc.). Following that, the samples were cultured on two distinct media kinds (nutrient agar, Macconky, agar). Nutrient agar is a flexible liquid medium that supports the growth of a wide range of non-fastidious organisms.

Gram-negative rods associated with Enterobacteris cade are selected and recovered using Macconky agar, a differentiation medium. (Atlas and others, 1995).

Serial dilution method: Take one milliliter of the original water sample and place it in the first test tube out of five. Each test tube has nine milliliters of distilled water in it. Next, fill the tubes from 10^-3 and 10^-5 with one milliliter each. Lastly, fill each media (Nutrient agar and Macconkey agar) with one milliliter using a micropipette, and then incubate for twenty-four hours at 37°C.

Furthermore, Alice and Alexanora's 2020 study discovered that treated water with about 10 mg/L of chlorin. The cultures on both media (Nutrient agar and Macconkey agar) increased from 10^-3 to 10^-5 over the course of a 24-hour incubation period at 37 °C using the same technique (serial dilution method after adding chlorine).

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2.1 Diagnosis macroscopic

Observing the formation of colonies in the media and researching their characteristics. Microscopical diagnosis: Gram staining is a method that divides bacteria into Gram positive and Gram-negative groups (Benson, 2001). The Vitek 2 system is then used to identify the bacteria.

Using this formula to determine the quantity of bacteria:

Number of bacterial colony CFU of water (ml) =1/dilution factor * number of colony

Patterns of substrate utilization are used by the Vitek 2 Compact to detect bacteria and other microorganisms. The appropriate cards are chosen based on the growth conditions of the organism to be tested and the findings of the Gram stain. Vitek 2 automation offers clinically relevant identification and susceptibility test results that are available the same day for most organisms encountered in the laboratory (plate 1)

Plate 1: The Vitek 2 system

2.2 Principle of the test

DensiCHEKTMto (0.5-0.9 McFarland) was used to standardize the suspension density after a 24-hour pure culture suspension was created. Subsequently, the suitable card was selected and both the card and the suspension were placed into a cassette. Subsequently, the cassettes were placed inside the device's Fill Chamber. The cassettes were put inside the Autoloader/Reader Incubator after the cards had been filled. After that, the cards were automatically scanned by an internal bar code reader before being sealed and put inside the Vitek 2 Compact's Carousel/Reader Incubator. After that, the cards were reviewed, and a report that could be printed was created. Compared to other conventional biochemical test kits like API, Vitek 2 Compact's automated analysis offers the advantages of a quicker turnaround time and does away with the need for visual interpretation of colorimetric results for species-level organism identification.

2.3 Diagnosis of bacteria

All isolates on Macconkey and Nutrient agar were identified using the Vitek 2 system test, colonial analysis, morphological analysis, and Gram stain.

3. Results

Chlorination is a commonly used disinfection method in sewage treatment process. However, resistant bacteria may survive chlorination and enter the receiving aquatic environment upon effluent discharge. There has been limited research on the effects of chlorination on bacterial survival in seawater.

About thirty sewage water samples were collected from various locations for the current study. The samples were processed using the serial dilution method and then cultural techniques, which led to the identification of seven bacterial isolates. Additionally, the results of the vitek test on plate 2 revealed that three of the seven bacterial isolates that were obtained were Gram Positive. *Streptococcus agalactiae G+ve*, *staphylococcus intermedius G+ve, Stu phylococcus epidermidis G+ve*, *Klebsiella sp premmonide G-ve*, *E-coli G-ve*, *Vibno cholerae G-ve*, *pseudomonds aeruginosa G-ve* List all of the names of the isolated bacteria in (Figures 1 and 2). Following the application of approximately 10 mg/L of chlorine to treat the sewage water, fewer bacteria colonies were found, with some species of bacteria—such as Vibrio cholera, Staph. intermedis, E. coli, and Klebsiella pneomoneae—exhibiting no growth at all. Display in (table1).

Plate 2: Serial dilution method then cultural techniques

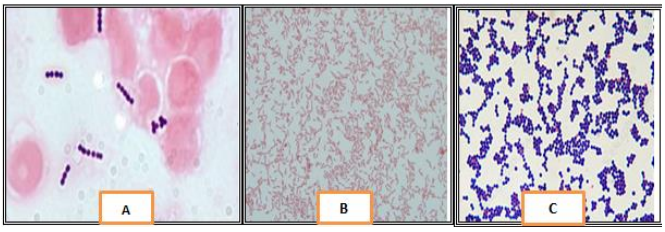

Figure 1: All isolated bacteria (Gram Positive) in sewage water (A-*Streptococcus agalactiae*, B-*Staphylococcus intermedius*, and C-*Staphylococcus epidermidis*)

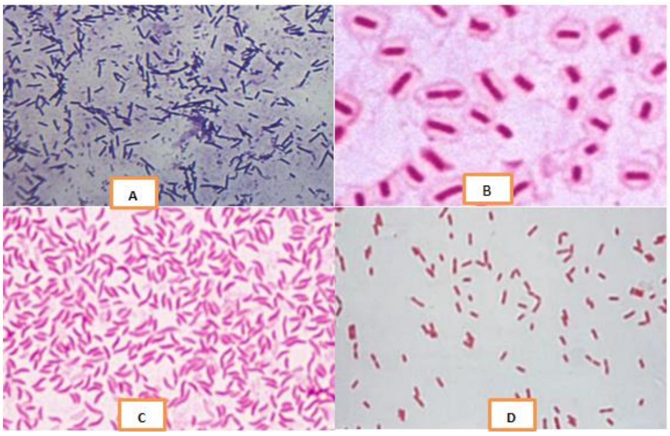

Figure 2: All isolated bacteria (Gram negative) in sewage water (A- *E-coli*, B- *Klebsiella pneumoniae*, C-*Vibrio cholera*, D- *pseudomonds aeruginosa*).

Table 1: The number of bacterial isolated colony of water (ml).

Bacterial isolated	Swage water without treatment	Sewage water after treated with chlorin (10 mg/l)
Strep.agalaciae	55	5
E.coli	30	0
Staph.intermedis	40	0
Staph. Epidermedis	15	3
Klels.pneumoniae	25	0
Vibrio. Cholera	33	0
Pseudomonas.spp	35	2

4. Discussion

Increasing the dosage of chlorine disinfection could effectively reduce the disruption of effluent bacterial communities to the indigenous seawater communities after discharge. Bacterial communities from saline-based effluents exhibited stronger survival in seawater, thus higher chlorine dosage was required to suppress their regrowth.

Water chlorination is the process of introducing chlorine or chlorine compounds, such as sodium hypochlorite, to water. Using this method, bacteria, viruses, and other microorganisms are removed from water. Particularly, chlorination is used to prevent the spread of diseases like cholera, dysentery, and typhoid.

During our study, sewage water contained the greatest number of bacteria compared to water that had been treated with chlorine. This is due to the fact that the presence of chlorine changed the structure of the bacteria and killed their cells, which reduced their population. Microorganisms are fatally affected by chlorine due to its oxidizing properties. Furthermore, chlorine oxidizes a broad variety of organic molecules, such as proteins and lipids. The impact of applying standard dosages of chlorine as a disinfectant to treated sewage water (Alice and Alexanora, 2020).

5. Conclusion

In addition to being crucial for the environment, properly treating our wastewater also benefits human health. There are a lot of fresh approaches to renewable energy that might be able to ease our current problems. We are addressing two problems at once when we combine the treatment of wastewater with the production of biofuel. After wastewater treatment, pollutants and suspended solids are removed, leaving behind potable water that is safe to return to the ecosystem uncontaminated by human activity.

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