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Bacteriological and Chemical Characterization of Groundwater Samples in Homs Governorate

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Abstract
Twenty-eight groundwater samples were collected from basins of various areas in Homs Governorate, which were harvested in sterile containers until they were transferred for analysis. They were germically analyzed by planting on the tregitol 7 agar plant. 35% of the samples showed positive bacterial contamination while 65% The concentration of sulphate, nitrate and nitrite in the samples was all within the limits allowed by the World Health Organization.

1. Introduction

Underground water is the most important source of fresh water on the earth including wells and springs. This water is continuously renewed by rains as an essential factor of hydrologic cycle factors. It's protected by soil layers as effective biologic and mechanical filters, meaning that there is natural filtering for underground water last consisted. This leads to ability to save this water for decades. Underground water is drinking water and can be used by human[1].

Water is considered drinkable when it's free of all microorganisms and pathogenic chemicals. The quality of water is so important since it affects health. Water pollution is an international problem since it causes a lot of illness such as cholera, typhoid, diarrheas and other disorders specially affecting children and newborn because of their weak immunity[2].

Water pollution is the water containing materials affecting its characteristics, quality and nature because the concentration of these materials is exceeding the allowed levels. According to World Health Organization (WHO), water pollution is defined as "any direct or indirect change in the composition of water because of human activity"[3]. Because of that, authorities of each country have put standard specifications for drinking water, and these standards may vary in its allowed concentration of materials. However, drinking water should be clear, odorless, tasteless, and free of harmful chemicals and pathogenic microorganism. Physical examination is not enough, since water may be clear, odorless and tasteless, but not free of pathogens. Drinking water should meet standards[4].

Microbial and chemical quality standards may vary between countries.

The pathogenic microbial groups and species that are potentially harmful to human health, which are often detected in drinking water and groundwater, vary.

Since most of the natural habitat is the human and animal digestive system that comes out with feces, microbial hazards are associated with human consumption of polluted water, which is a source of bacteria that cause many diseases, viruses, parasites and worms. Fecal contamination of water is a serious problem because of the risk of exposure to pathogens often borne [5].

The concentration of pathogens in the stool is weak, but their numbers are relatively large and not easy to detect. It takes time and is expensive. Instead, the presence of pathogens is determined by testing the presence of coliform bacteria, which is used as an indicator of fecal contamination, An idea about the state of water[6]

coliform bacteria is Known as Gram-negative bacilli, are a typical group of total coliforms and include several strains of bacteria, such as Escherichia Coli and Kleibsiella, found in feces, characterized by temperatures up to 44.5 ° C, More accurate for fecal contamination than the total number of colons. At this temperature only fecal coliform bacteria grow and inhibit the growth of ecologics. The presence of any coliform in water is a danger that can not be ignored [7-8]

There is a wide range of chemicals and pathogens that pollute the groundwater and reduce its oxygen content and thus make this water unsuitable for human consumption. Recall these compounds (nitrates, nitrite, sulphates).

Nitrates can reach surface and ground water as a result of agricultural activity, including the excessive use of inorganic nitrogen fertilizers and organic fertilizer. [9] Once contaminated with nitrate, it will remain contaminated for decades[10]. The toxicity of nitrates in humans is attributed to the return to nitrite, where the biological effect of nitrite on humans is the oxidation of hemoglobin to metoglobin, which is unable to transport oxygen to the tissues causing the syndrome of the blue child and its associated symptoms such as high blood pressure and increased rate of strokes Heart, diarrhea, blue-gray color may lead to death [11]

Sulfates : Sulfates are generally non-toxic, but recently concerns have been raised about the health effects

associated with the presence of high concentrations of sulphate in water, which have been associated with many cases of inflammation of the intestines and diarrhea and thus dehydration, especially in children and infants, when using water sources with concentrations less sulfur Diarrheal cases have decreased in all children [12]

Many studies conclude that there is a need to periodically monitor water quality, because the increased concentration of chemical agents, microbial contaminants, industrial waste and improper disposal of wastewater will increase the threat to human health[13].

2. Research material:

Petri Dishes, sterile bacterial filtration paper, glass flasks,Trigetol 7 agar, Filtration apparatus, Molecular Absorption Spectrometer.

3. Research Methodologies:

Twenty-eight samples were collected in sterile containers. The analysis was performed two hours after sampling. The sample was sprayed on a cellulose membrane with 0.45 µm pores where the bacteria were collected on the filtration membrane surface, the membrane was transferred with sterile forceps and placed on TRIGETOL 7 AGAR, and incubated for 24 hours at 37 ° C

The chemical analysis of the studied samples was performed using the spectral method. Two cells were used for each electrolyte to be detected, a cell containing distilled water was considered a witness, the other cell was placed in the studied droplet detector. (5 minutes for nitrate, 15 minutes for nitrite and 5 minutes for sulphate), then stirred for 1 minute. Measurements were performed for each trace. After determining the maximum wavelength of the measured residue under the applicable conditions, Discriminate (500 nm nitrate,507 nm for Nitrite 450 nm sulfate).

Table 1. the used samples and Water basin taken from it.

Aquarium water	Coastal Basin	Assi Basin
Number of samples	2	26

4. Result and discussion:

Table 2. Show the bacterial results of the samples::

Aquarium water	Sample number	Date of sample collection	Total bacterial counts cfu\100ml	Total coliform cfu\100ml	Escherchia.coli cfu\100ml
Assi Basin	1	December	0	0	0
Assi Basin	2	December	9	8	0
Assi Basin	3	December	$2.5.10^1$	$1.2.10^1$	0
Assi Basin	4	December	1.10^1	5	0
Assi Basin	5	December	$0.5.10^1$	4	0
Assi Basin	6	December	$2.25.10^2$	2.10^2	0
Assi Basin	7	December	0	0	0
Assi Basin	8	December	$1.5.10^1$	$1.3.10^1$	0
Assi Basin	9	December	$8.5.10^2$	$7.5.10^2$	$2.75.\ 10^2$
Assi Basin	10	December	$9.5.10^2$	$7.5.10^2$	$1.75.\ 10^2$
Assi Basin	11	December	$6.5.10^2$	$4.5.10^2$	$3.5.\ 10^1$
Assi Basin	12	December	$1.2.10^1$	4	1
Assi Basin	13	December	$1.5.10^2$	6.10^1	$5.5.10^1$
Assi Basin	14	December	0	0	1
Assi Basin	15	December	4	0	1
Assi Basin	16	December	$1.10.10^2$	7.10^1	$3.\ 10^1$
Assi Basin	17	December	7.10^2	$5.5.10^2$	$9.\ 10^1$
Assi Basin	18	December	$2.9.10^2$	$1.75.\ 10^2$	$3.\ 10^1$
Assi Basin	19	December	7	0	0
Assi Basin	20	December	3	0	0
Assi Basin	21	December	$6.\ 10^1$	$4.5.10^1$	$2.\ 10^1$
Assi Basin	22	December	$9.5.10^2$	$7.5.10^2$	$1.9.10^1$
Assi Basin	23	December	$1.5.\ 10^1$	6	4
Assi Basin	24	December	$1.5.\ 10^1$	4	0
Assi Basin	25	December	$8.9.10^2$	$5.\ 10^2$	9.10^1
Assi Basin	26	December	4	2	1
Coastal Basin	27	December	$4.5.10^2$	$2.9.\ 10^2$	$1.2.10^2$
Coastal Basin	28	December	9.10^1	$3.\ 10^1$	$1.2.\ 10^1$

The method used to discover total coliform , fecal bacteria and Escherichia coli is colony form using tregitol 7 agar mediums, Where usually in Laboratories the type of colony is diagnosed on the light of shape characteristics without using any other means, The characteristics of the bacteria in this form as shown in figure (1),coliforms produce yellow to yellow-green colonies, E. coli produces yellow colonies.

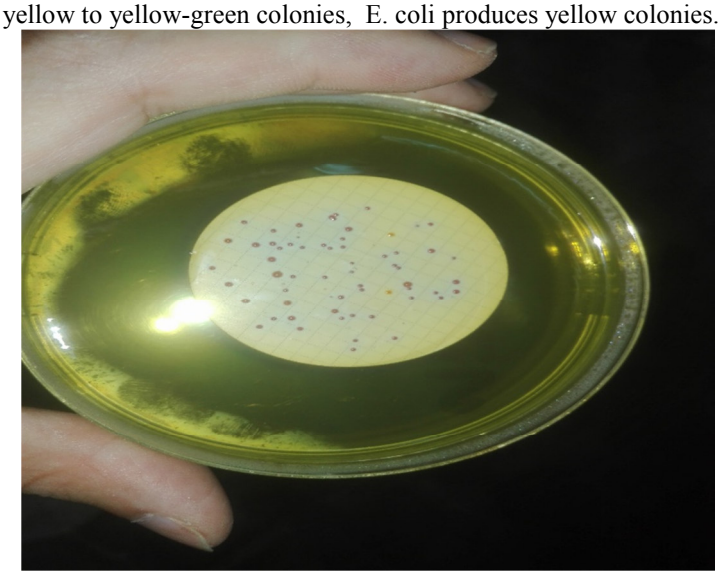

Figure 1. the the bacteria in Tregitol 7 agar medium

Table 2. Show the chemical results of the samples:

Aquarium water	Sample number	Date of sample collection	Concentration of Nitrate mg/l	Concentration of nitrite mg/l	Concentration of sulphates mg/l
Assi Basin	1	December	21.56	0.0033	28
Assi Basin	2	December	22.44	0.0033	32
Assi Basin	3	December	15.3	0.011	28
Assi Basin	4	December	13.5	0.012	12
Assi Basin	5	December	16.8	0.009	27
Assi Basin	6	December	14.96	0.01	25
Assi Basin	7	December	12.76	0.0066	69
Assi Basin	8	December	13.64	0.0033	42
Assi Basin	9	December	22	0.0561	12
Assi Basin	10	December	14.04	0.0197	9
Assi Basin	11	December	15.84	0.0198	12
Assi Basin	12	December	8.02	0.013	186
Assi Basin	13	December	11.88	0.026	70
Assi Basin	14	December	10.11	0.0198	7
Assi Basin	15	December	23.3	0.003	2
Assi Basin	16	December	12.3	0	32
Assi Basin	17	December	10.81	0.033	44
Assi Basin	18	December	19.8	0.006	3
Assi Basin	19	December	26.4	0.004	10
Assi Basin	20	December	29.92	0.007	244
Assi Basin	21	December	9.69	0.005	211
Assi Basin	22	December	8.41	0.0133	177
Assi Basin	23	December	147	0	68
Assi Basin	24	December	33	0.115	0
Assi Basin	25	December	7.04	0.0099	157
Assi Basin	26	December	24.1	0.002	52
Coastal Basin	27	December	23.9	0.198	12
Coastal Basin	28	December	12.31	0.003	51

5. Conclusion

The differentiative medium tregitol 7 agar is a good selective differentiative medium, and the Escherichia Coli is one of the most obvious colony. (35%) of the samples gave a positive result of bacterial contamination, while (78%) gave a positive result of contamination with Bacillus coli, while E. coli showed 60%.

The results of the chemical analysis were concentrations of sulfur, nitrate and nitrite within the limits allowed by the World Health Organization.

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