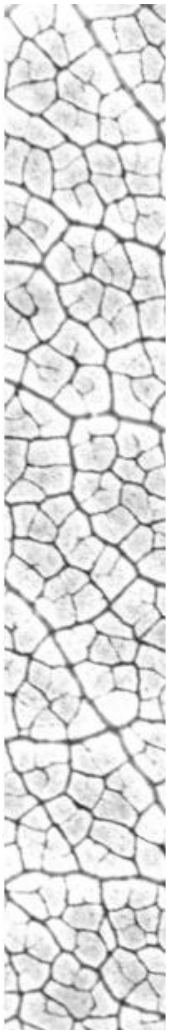

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Effect of Zamzam's water and magnetized water on *E. coli* o157: h7 growth compared to other pathogens

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Abstract
The current study aims to evaluate the effect of Zamzam's water and Magnetized water on the growth of *E. coli* O157: H7 compared to a group of other pathogens including Staphylococcus, *Pseudomonas aurginosa*, proteus, Klebsiella, *Enterococcus fecalis*, Bacillus and Enterobacter. Chemical analysis of water samples from different sources was carried out (Zamzam's water, magnetized water, hot water, distilled water and tap water). The physical properties were determined for Zamzam's water in Long intervals which was stored in room temperature. Trybtose soy broth was prepared with different water samples with different types of bacteria. Growth density was measured by UV Spectrometer. The results showed that the water samples were different in support of growth. The highest value of bacterial growth in distilled water (0.6 nm) was compared with the lowest value for bacterial growth in case of Zamzam's water (0.1 nm) In supporting growth between these two values. As for the types of germs used, *E. coli* O157: H7 was the best developed bacterium using different water samples with (0.6 nm) distilled water, (0.5 nm) hot water compared to the other microbes studied (0.6 nm) for tap water for Enterobacter, Bacillus.

Keywords: Zamzam's water, Magnetized water**,** *E. coli* O157: H7, other bacteria

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INTRODUCTION

The more water was natural and not mixed with chemicals or pollutants the more it was beneficial for human health, so natural spring water and mountain running water are considered the best sources for human drinking water as they are cleansed naturally by the Earth's magnetic field (Al Nouri et al. 2014).

Zamzam's water is the best drinking water on the face of the Earth it is not only backed by religious scripts, but also it's proved by scientific facts , among these experiments the one that was held in 2012 by scientists from Hedenberg College, these experiments proved that Zamzam's water is deferent from other sources of water, and that it has unique features (Al-Zuhair et al. 2005).

Zamzam's water has high energy levels that affects human's health in a positive way, this energy is obtained when the water runs beneath the mountains and the cracks within the mountains of Mecca which was scientifically proved to be the centre of the Earth, the thing that makes the magnetic energy applied by them the with high leveled energy .These unique features of Zamzam's water, and it's holiness which was mentioned by prophet Muhammad makes, it the representative of magnetized water (Al-Zuhair et al. 2005).

The process of adding magnetic energy to water helps the water regain it's lost elements due to pollution and mixture with chemicals, it also aids in breaking down salt particles making it easy for absorption.

From all the mentioned above one most say that Zamzam's water is holly, ionic, alkaline, mineralized, and magnetic (Alfadul and Khan 2011, Fahad et al. 2017).

Features of Magnetized water the main features of magnetized water are good electric conductions, good solvent, increases the rate of chemical reactions, fast evaporatorting permeable, and high concentrations of dissolved oxygen, has high surface tension.

Magnetising water is one of the approaches used to give the water back its effectiveness, Magnetized water is not only good for human's health but also it's beneficial for plants, as it strengthen their defences against vermin and diseases, it also increases the production of farm animals, used in constructions to enhance the quality of concrete (Liu et al. 2010, Strasak et al. 2005).

Types of magnetized water North Poled magnetised water: a water magnetized using the North Pole of a magnet. South Poled magnetized water: a water magnetized using the South Pole of a magnet.

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Dual poled magnetized water: a water magnetized using two poles of a magnet.

Each type mentioned above has its uses as they bear unique features which helps in recovering from diseases.

The North poled magnetized water is used to treat inflammations like urinary tract inflammations, and some other inflammations like eczema, and also can give the body tranquility and the ability to resist pain and inflammations.

The South poled magnetized water is used in treating diseases caused by bacteria like abscesses and pimples, it's also used to treat some virua inflammations, and dermal diseases, it is advised to be used internally by drinking and externally by washing the infected body parts with it.

The dual poled magnetized water is used for treating digestive problems, some problems in the urinary system, and it's used as a refresher for the whole body, this kind of magnetized water is advisable for those working to improve their magnetic capabilities. A number of studies report the influence of the electromagnetic field on the inhibition of growth of microbes and fungi, as well as slowing down their multiplication (Ibrahim 2006, Laycock 2007, Szcześ et al. 2011).

Aim of the study: Evaluation of the effect of Zamzam's water and magnetized water on the growth of studied bacteria *E.coli* O157:H7, compared to variety of pathogenic bacteria like Staphylococcus, *Pseudomonas aeruginosa*, Klebsiella, *Enterococcus fecalis*, Bacillus, Enterobacter , and Proteus. And also the chemical and physical features for the water samples were taken from different sources.

MATERIALS AND METHODS

Bacterial Isolates

* Bacterial isolates were obtained from the College of Science\ Department of biology.

Culture Media

* Preparing (TSB) Media for each type of water in the study, and using spectrophotometer to estimate absorption, as for the control tube it was prepared from McFarland tube which was prepared from barium chloride and TSB Media to maintain the density suitable for the growth of the bacteria and getting rid of the colour of the media.

Method

1- Bacterial isolates were obtained from the College of Science\ Department of biology. (*E.coli* O157:H7, Staphylococcus, *Pseudomonas aeruginosa*, Proteus, Kebsiella, Enterobacter, Bacillus, *Enterococcus fecalis*).
2- Physical Features where investigated for zamzam water in long intervals which was stored in room temperature, A change in the colour taste and odour was noticed.

Table 1. Chemical analysis of Zamzam's water samples

Zamzam's water	PH	Na^{+1} mg\L	K^{+1} mg\L	CL^{-1} mg\L	$CO3^{-2}$ mg\L	$HCO3^{-1}$ mg\L
three year	7	135	52.5	95	Nill	323
two year	7	220	44	185	Nill	107
4-months	7.2	135	41	115	9.76	244
2-months	7.2	110	40	60	Nill	300
1-months	7.2	80	24	115	Nill	268
zamzam fresh	7.2	160	48	135	Nill	219

3- Investigating the chemical and physical properties of water taken from the General Authority for Groundwater in Nineveh .
4- These experiments were conducted in General Authority for Groundwater in Nineveh as they were (PH , Na^{+1}, K^{+1} ,Cl^{-1} ,$CO3^{-2}$,$HCO3^{-1}$, E.Cμhos\cm ,T.D.S, Ca^{+2} ,Mg^{+2} ,$NO3^{-1}$, $SO4^{-2}$)
5- TSB Media were made from different types of water: (tap water, Zamzam's water, magnetize water, mineralised water, distilled water, and hot water). The media were sterilized by filtration in order to keep the features of each type of water, and to offer the same environmental conditions for each experiment.

As for the control tube it was prepared from McFarland tube, which was prepared from barium chloride and TSB Media, in order to maintain the density suitable for the growth of bacteria, and getting rid of the color of the media.

Absorption was read for all inoculated bacteria, and after 24 hours of incubation the spectrophotometer was standardized by MacFarlane tube No-1- which was prepared earlier.

RESULT AND DISCUSSION

Table 1 demonstrates the chemical analyses for minerals and salts dissolve in Zamzam's water which was within the range of WHO for samples stored within the range of room temperature for three years, two year, 4-months, 2-months, and fresh Zamzam's.

The results were fairly similar and there were no change within the physical feature as there were no changes in color, order, or taste and this is due to the chemical components that prevents the activity of germs, fungus, and bacteria.

This is what the study proved as there are no growth for algae or bacteria causing abnormal changes in taste and odour (Zaiat 2007).

Table 2 shows the chemical properties on Zamzam's water, distilled water, magnetized water, well water, tap water, and mineral water

The pH of samples was within the range of Zamzam's water, magnetized water, mineral water (6.5), distilled water (5), well water (8), tap water (7) so they are all within the range of drinking water between (6.5 - 9.2).

The sodium (Na) concentration within Zamzam's water was (80), well water (200) as well as an increase in the concentration of the dissolved salt TDS for well

Table 2. Chemical analysis of water samples

Type of water	PH	Na^{+1}	K^{+1}	CL^{-1}	$CO3^{-2}$	$HCO3^{-1}$	TDS	Ca^{+2}	Mg^{+2}	$NO3^{-1}$	$SO4^{-2}$	E.C µhos\cm
Zamzam water	7	80	24	115	Nill	268	885	56.2	19.5	8	125	1210
Distilled water	5	Nill	Nill	Nill	Nill	Nill	0	Nill	Nill	Nill	Nill	2
magnetized water	6.5	14	2.1	19.9	Nill	140	346	46.5	14.6	0.5	56.3	513
tap water	8	200	1	130	Nill	585	1520	112	87.8	28.7	353	2170
Tap water	7	12	1.3	14.9	Nill	146	320	46.5	14.1	0.3	60	417
mineralised water	6.5	2.6	0.4	4	Nill	68.3	175	25.7	8.78	0.33	43.2	228

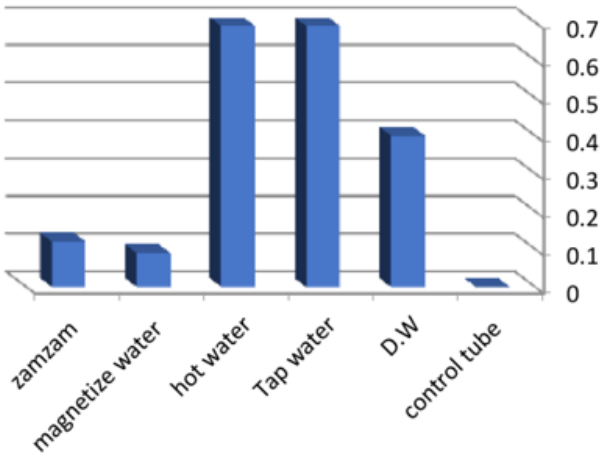

Fig. 1. The effect of water types on bacteria *E.coil* O157:H7

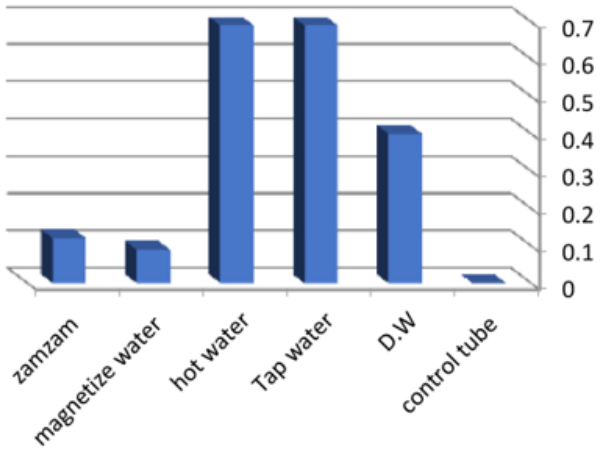

Fig. 2. The effect of water types on bacteria Klebsiella

water (1520), chlorine concentration (130), bicarbonate (585), calcium (112), magnesium (87.8), nitrate (28.7), and phosphate (353). They all exceed the limits of WHO for drinking water. Therefore well water would cause trouble to humans consume.

Distilled water as it is devoid of ions, and salts. a small amount which was not worthy of mentioning appeared yet still, the water was within the range of WHO for drinking water (WHO 2011).

Mineral water's salt, and other components concentrations were within the range of WHO for drinking water, while few components exceeded the limit of the WHO due to prolonged storage and mal marketing (World Health Organization 2000).

Magnetized water's salt concentration and other minerals concentrations were excellent, and within the range of WHO for drinking water as they were: sodium (14), bicarbonate (Nill), TDS (346). This is because magnetizing water is one of the most important procedures that are used for keeping the water fresh and efficient, it is possible by applying magnetising field to water in different capacities, as in (1000 gauss) the water capability of absorbing minerals increases by 5-8%.

Fig. 1 Shows the effect of distilled water, tap water, hot water, magnetized water, Zamzam's water, on *E.coli* O157: H7 showing high rate of of bacterial growth (0.49, 0.47, 0.85) respectively for distilled water, tap water, and hot water.

Distilled water, tap water, and hot water are considered lethal to bacteria, so when they are used to prepare (TSB) Media the bacterial growth is (0).

Magnetized water and Zamzam's water affected *E.coli* O157: H7 growth as (0.42nm, 0.38nm) respectively indicating its ability to weaken the growth of bacteria as it contains energy. The study showed that magnetized water is water which has been passed through a magnetic field of 1000 gauss, this field changes a lot of waters features, increases it's quality, and arranges it's ions.

In experiments in which *E. coli* has been added to the water running between two magnetic polarities with a speed of 0.5 L *per* hour and intensity of magnetic field of 39.9 KA/m, a number of bacteria have been reduced from 10^{5} to 0.

Magnetized water has been used in agricultural and medical fields, a lot of scientists see that implying magnetising science in medical fields would have a great future, as it was used in the treatment of wounds, lowering the sense of pain, increasing immunity and fighting against kidney stones and other medical cases (Toledo et al. 2008).

Fig. 2 shows the effect of distilled water, tap water, hot water, Zamzam's water on the growth of Klebsiella was (0.58) for distilled water, (0.47) for tap water, and (0.49) for hot water. These results equal *E.coli* growth as the effect of nutrients was the are similar to key for supporting the growth of bacteria and there was no effect at all for the type of water on the growth of bacteria.

As for the effect of Zamzam's water and magnetized water it was inhibitory on Klebsiella (0.42, 0.39) respectively, this too was equal to the effect of Zamzam's water and magnetized water on *E.coli* O157: H7.

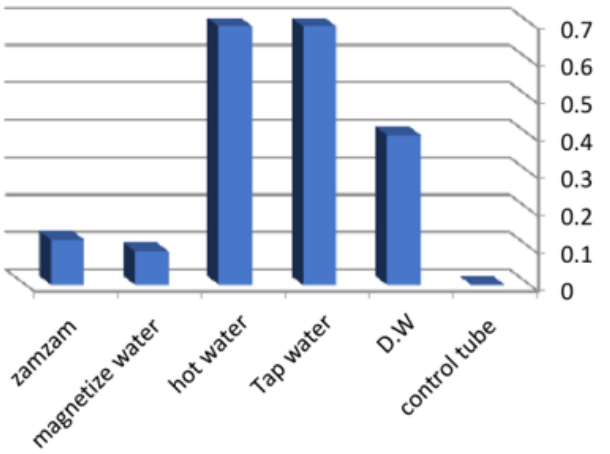

Fig. 3. The effect of water types on Proteus

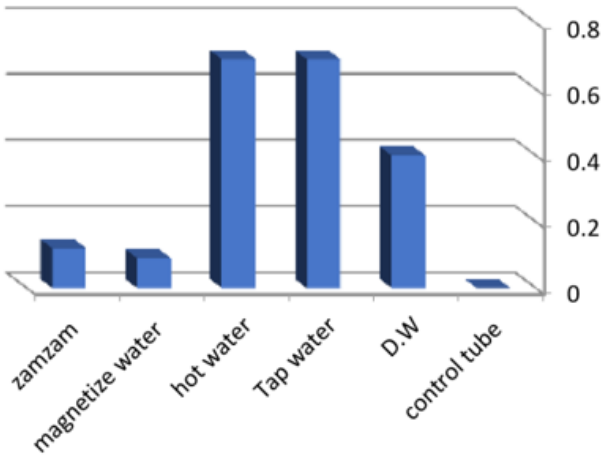

Fig. 4. The effect of water types on a *Pseudomonas aeurginosa*

Klebsiella is a major threat to human health in many countries around the world as it causes intestinal diarrhoea, Diuresis syndromes, inflammations, and chronic hemorrhagic colon. It can be transmitted through polluted water and food.

Klebsiella is a drug resisting bacteria so it causes problems when trying to treat, also it causes a lot of health hazards such as pneumonia (Yanming et al. 2008).

Fig. 3 shows the effect of distilled water, tap water, hot water, magnetized water, and Zamzam's water on the bacteria Proteus.

The effect of water types of water upon the growth of bacteria was (0.58) for distilled water, (0.47) for tap water, and (0.49) for hot water. These ratios are similar to those of *E.coli*.

As the effect of magnetized water on Proteus was (0.39), and Zamzam's water on Proteus was (0.42) they are similar to the ratios of the two previous bacterias.

Proteus bacteria is drug and antibiotic resistant, causing real trouble when treated, it causes a lot of health problems like UTI. (Hubert et al. 2002).

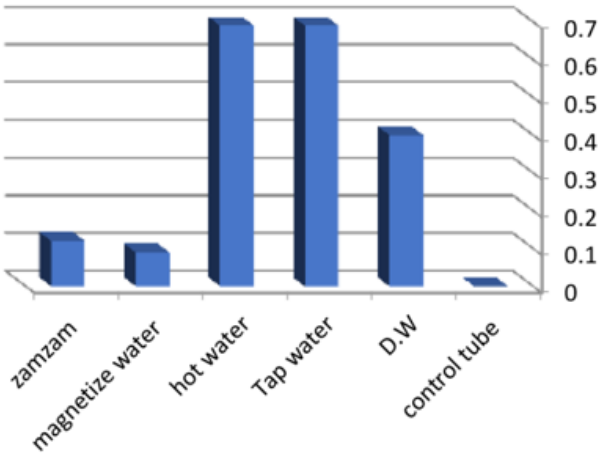

Fig. 5. The effect of water types on Staphlococcus

Fig. 4 shows the effect of distilled water, tap water, hot water, magnetized water, and Zamzam's water on pseudomonas aeruginosa.

The effect of distilled water was (0.58), tap water (0.47), and hot water (0.49), as it shows these results are similar to those of *E.coli* O157: H7.

As the effect of magnetized water was (0.39), and Zamzam's water (0.42) and so it equals the effect of Zamzam's water and magnetised water for the two bacteria's *E.coli* and pseudomonas.

Pseudomonas is considered one of the reasons of wound and burn inflammation, pool water pollution as it is chlorine ressistant, it causes dermal inflammation, ear inflammation, throat inflammation, and eye inflammation, it's also antibiotic resistant (Allan et al. 2000, Chang and Kim 2018).

Fig. 5 shows the effect of distilled water, tap water, hot water, magnetized water, and Zamzam's water on Staphylococcus.

As the effect of distilled water was (0.58), tap water (0.47), and hot water (0.49) these results were similar to those of *E.coli.*

As for the effect of magnetized water (0.39), and Zamzam's water (0.42) these results are similar to those of *E.coli* O157:H7.

Staphylococcus is an antibiotic resistant bacteria causing a lot of health problems like wound infections, Burn infections, and dermal infections (Kohno et al. 2000).

Fig. 6 shows the effect of distilled water, tap water, hot water, magnetized water, Zamzam's water, on *Enterococcus fecalis* by the ratio of (0.69) for hot water, (0.4) for distilled water, (0.69) for both tap water, and hot water.

From the previous results it was found that the effect of types of water on bacterial growth in Enterococcus is different from that on *E.coli*, as the effect of tap water, and hot water on bacterial growth of Enterococcus was higher than on other bacterias used in the study, this is due to the difference in the physiology of this bacteria

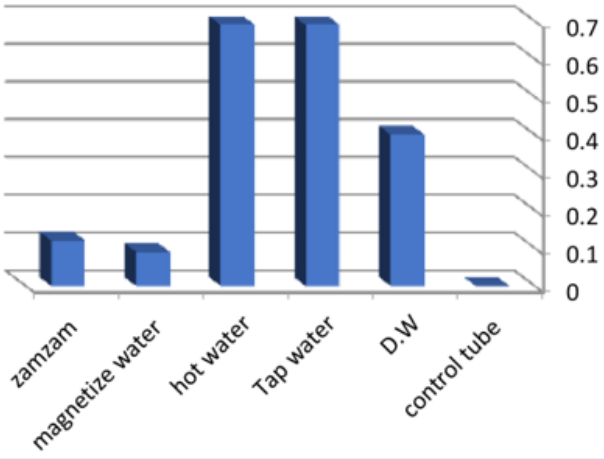

Fig. 6. The effect of water types on *Enterococcus fecalis*

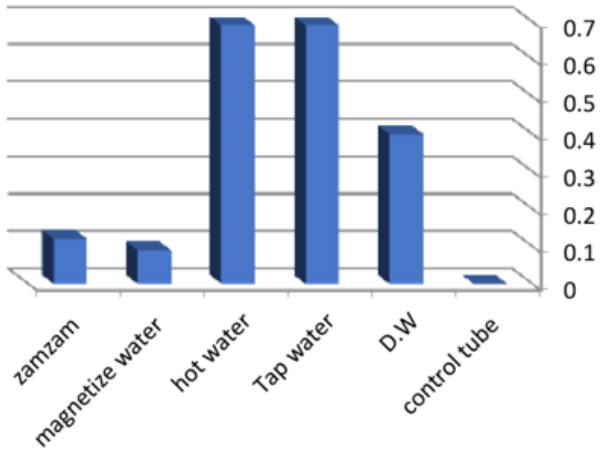

Fig. 7. The effect of water types on bacteria Bacillus

and it's ability to use nutrients found in the media to grow.

Magnetized water and Zamzam's water has a great inhibitory effect on this bacteria (Enterococcus) with the ratio of (0.09) and to (0.12) respectively.

This difference in inhibitory effect of magnetized water and Zamzam's water between E.coli and Enterococcus is due to the difference between the types of bacteria in the manner of cell wall length, the thickness of the glycogen layer, and the virulance factors they both acquire, *E.coli* has some sort of shigatoxin, which makes it the reason for many diseases.

While Enterococcus causes water pollution, teeth decay and others, yet still it's less virulant than *E.coli* (Goyal et al. 2017).

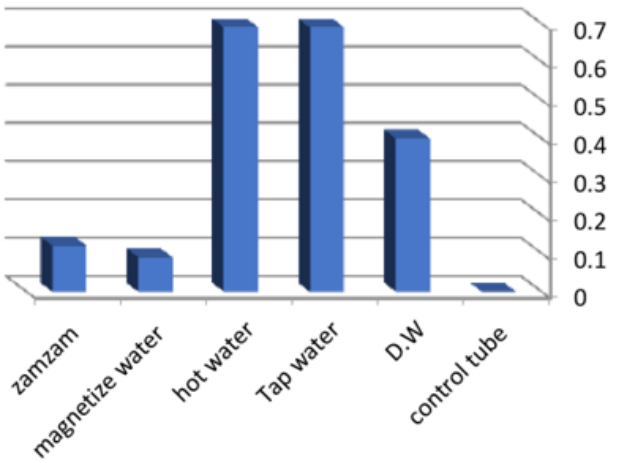

Fig. 8. Shows the effect of water types on bacteria Enterobacter

Fig. 7 shows the effect of distilled water, tap water, hot water, magnetized water, and Zamzam's water on the bacteria Bacillus with the ratio of (0.4) for distilled water, (0.69) for each of hot water and tap water. These results are similar to those of Enterococcus, and different from those of *E.coli* O157:H7 because Enterococcus and Bacillus are gram positive bacteria while *E.coli* is a gram negative bacteria that differs in the composition of it's cell wall and other physical feature, even though some of it's genera can form spores and cause diseases.

Magnetized water and Zamzam's water showed an inhibitory effect with ratio of (0.09), and (0.12) respectively, this ratio is similar to that of the Enterococcus. and differes from that of *E.coli* O157 :H7 (Faraj and Muhamad 2012, Yanming et al. 2008).

Fig. 8 shows the effect of water types on Enterobacter as it was (0.69) for each of tap water, and hot water, (0.59) for magnetised water, (0.12) for Zamzam's water, these results are different from the results of *E.coli*, but similar to those of Enterococcus and Bacillus it might be due to the resemblance in virulence factors which are low in both.

Magnetized water and Zamzam's water inhibit the growth of Enterobacter and Bacillus in a lower rate than they inhibit the growth of *E.coli* O157: H7 due to the high virulance factors and the resistance to antibiotics and drugs that *E.coli* (Nuaman et al. 2014).

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