



Study of the prevalence of bacterial contamination in some steam baths in Tripoli

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Abstract The study was conducted on four steam baths in Tripoli at a place where people are located for the purpose of treatment or relaxation and recreation. The samples were collected by means of a cotton swab from the steam room, roof, walls and floor. The total colony counts based on sampling sites was the highest number of bacteria: floor, walls, roof, and less in the steam room. The predominant species were gram-negative rods (49.4%), gram-positive cocci (45.6%) and gram-positive rods (4.9%) respectively. Based on biochemical test and the Api 20E system, the following types were identified (*Escherichia coli*, *Edwardsiella Tarda*, *Aeromonas hydrophila*, *Vibrio alginolyticus*, *Plesiomonas shigelloides*, *Salmonella choleraesuis*, *Xanthomonas maltophilia*, and *Shewenella putrefacien* followed by positive spherical bacteria and *Staphylococcus epidermis*, *Staphylococcus aureus*, *Micrococcus luteus*, *Micrococcus roseus* respectively. : The results also showed that the highest total number of bacteria in the baths in this study was higher in S1, U2 and lowest in W3.

Keywords: contamination, steam baths, bacteria, Enterobacteria, Tripoli.

دراسة مدى انتشار التلوث البكتيري داخل بعض الحمامات البخارية في مدينة طرابلس

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الملخص أجريت هذه الدراسة على 4 حمامات بخارية بمدينة طرابلس للتعرف على أنواع البكتيريا المتواجدة داخل الحمام البخاري، بإعتبارها مكان يتواجد به الأشخاص لغرض العلاج أو الإستجمام والإسترخاء والترفيه، حيث جمعت العينات عن طريق الماسح القطني من غرفة البخار، الأسقف، الجدران، والأرضية، كانت أعلى نسبة للعدد الكلي للبكتيريا في عينات الأرضية، الجدران، الأسقف، ثم غرفة البخار على التوالي، أعلى عدد كلي للبكتيريا في الحمامات البخارية كان في S1 و U2 وأقلها في W3. من خلال النتائج المتحصل عليها تم التعرف على الأنواع البكتيرية التالية، حيث كانت نسبة البكتيريا العصوية السالبة لصبغة جرام أعلى من بقية البكتيريا، أنواع البكتيريا السائدة كانت البكتيريا المعوية بنسبة 49.4% وأعلىها *Escherichia coli*، *Edwardsiella Tarda*، *Aeromonas hydrophila*، *Vibrio alginolyticus*، *Shewenella putrefacien* تليها البكتيريا الكروية الموجبة و كان أعلىها *Staphylococcus aureus*، *Staphylococcus epidermides*، *Micrococcus Roseus*، *Micrococcus Luteus* على التوالي، وأقلها البكتيريا العصوية الموجبة *Micrococcus brevis*.

الكلمات المفتاحية: التلوث، البكتيريا، الحمامات البخارية، طرابلس.

INTRODUCTION

The word "spa" may be derived from the Walloon word "espa" meaning fountain. This, in turn, came from the name of the Belgian town Spa, where in the 14th century a curative, thermal spring was discovered. Spa may also originate from the Latin word "spagere" (to scatter, sprinkle, moisten) or may be an acronym of the Latin phrase "sanitas per aquas" (health through water) [1] The Romans were influenced by the Greeks, building their own thermal baths in mineral and thermal springs. Often the key to developing such a resort is not only to restore the activity of soldiers Injured but also centers of recreation and recreation for healthy soldiers. , Romans considered the baths more important than some sports. In addition to cleansing, exercise, socialization, relaxation, worship, medical treatment was also widely applied. The treatment consists of immersing the infected parts of the body in water, (especially for rheumatism and genital diseases). Over the years, the bathing culture of the

Romans gradually grew and changed towards a place of relaxation and pleasure, rather than medical treatment, although this is still offered. Where the Romans prefer the use of bathrooms and water too hot and renew their appetite and activity [2] in the sixteenth century, the image of public baths deteriorated again in many countries, resulting in the closure of many public baths. It was considered the source of infectious diseases such as syphilis, plague and leprosy, and the bathrooms have become dangerous meeting places in society, in the eighteenth and nineteenth centuries about 1800 years ago, the culture of interest grew from bathing. In addition, attempts were made to analyses mineral water, with the aim of improving its use in medicine, and when preparing a mixture of water similar to the famous hot water for treatment [3], Doctors have been convinced that each disease has its own special therapeutic nature, which can be detected by chemical analysis [4].

Traditional baths, known as Steam baths or Moorish baths are a widespread culture in Maghreb countries, including the Middle East (mainly Syria) and Turkey [5,10] They are highly frequented public places not only for personal hygiene, but because Steam baths were considered for a long time as a cultural heritage originally attached to religious and familiar rituals.

Formerly, traditional bath was adapted to the precepts of Islam, which calls for meticulous hygiene and regular ablutions for prayer, performed as full.

Body cleanse. In most cases, Steam baths are visited frequently by women in order to recover from childbirth or illness, as well it is considered as a real beauty corners related to different provided cares such as; hair removal, dyeing, application of scrubbing, massage and body care, women and men alternatively use Steam baths and it is strictly forbidden for the simultaneous use. Traditional baths are in general structured as enclosed place consisting of a series of rooms; hot steamy room, warm room, cold room and the rest room where people get wiping and dressing [6-9] Nowadays, with the emergence of private or individual baths and the progress of therapeutic virtues of balneotherapy, usefulness of Steam baths extends to be much more associated with relaxation, well-being and even to treat or prevent several dermatological and rheumatological illness [10, 14].

Steam baths are an indoor place, where many people go for recreation or relaxation, some of which use places to treat diseases such as rheumatism and genital diseases. [15] Bathing, painting, applying henna, rubbing, massage and body care [5] may become dangerous places and source of infectious diseases such as syphilis, plague and leprosy, Germs [16] including fungi, viruses and bacteria, can be sources of indoor bioterrorism. Bacterial contamination of indoor environments is ubiquitous and poses a serious threat to public health [17].

Steam baths are of great health importance because they can be transformed into microbial reservoirs. If the conditions of hygiene and health are neglected, especially in public places and indoor places of common use, where they are exposed to pollution through sewage and misuse, baiting people infected or infected with infectious diseases, etc [18].

Bacteria are the most common microbiological groups that cause microbial contamination and the most common is the group of Gram-negative bacteria, including Enterobacteriaceae, which is one of the most important microbial indicators to identify the occurrence of fecal contamination, which is the most important and most common methods of transmitting diseases to humans, either directly or indirectly [19].

Gram-positive bacteria are important. *Enterococci* faces are highly adaptable to inappropriate growth conditions. They resist bile, antibiotics and heat, *Staphylococcus sp* Colonies are marked as large Shiny skin that lives on the skin or inside the nose in healthy people and causes different types

of Diseases that affect various parts of the human body such as skin infections, wound infections, Burns, boils. Gastrointestinal infections, food poisoning, lung inflammation, bladder, sinuses, Inflammation of the middle ear. It is one of the most common infections in hospitals causing often-post-operative wound infections [20].

Bacteria live within their family of humans or animals and can live outside their host and are usually affected by surrounding environmental conditions, which are common in indoor [21] [22] Microbial presence in study was carried out to evaluate the state of hygiene of nine Turkish baths in three provinces, Isparta, Burdur and Afyon, where most samples contained *Staphylococcus sp*, *E.coli* and another type of intestinal bacteria. The water samples of the swimming pools affected *E.coli*, *micrococcus sp* positive Gram, and type of intestinal bacteria [23].

This study aims to identify the total number and types of bacteria found in steam baths, as a closed environment and are frequented by many people.

Materials and Method

Samples were collected from four steam baths in Tripoli in March 2018. Samples were taken while visitors were in the evening. Samples were collected by wiping with a sterile cotton swab. For sampling of steam room, roof, walls and floor. Was swabbed by moving the swab with circular motions in a 10 cm diameter circle. The swab was rotated during sampling to ensure that the entire surface of the swab was used. The content of the lumbar scanner was developed in the TSA solid media and incubated at 37 ° C for 24 h. The phenotype of developing colonies was isolated and the bacterial colonies isolated and preserved in the slant nutritious nutrient agar.

Cultivation of samples and Isolations

The samples which are obtained from the steam baths using cotton swab were inoculated to isolate bacteria on the following media to differentiate between similar species: Nutrient Agar, MacConkey Agar, Blood Agar and Mannitol Salt Agar and incubated at 37 ° C for 24 hours.

Biochemical tests

Some of the biochemical tests were performed on the bacterial isolates: the Oxidase test [24], the Catalase test, the Citrate, Motility test, Voges Proskauer test, methyl red, the Coagulation enzyme test Coagulase, Triple Sugar Iron, and Indol [25], Urease test [26], api 20 E diagnosis system for Enterobacteriaceae and other non-fastidious Gram-negative rods.

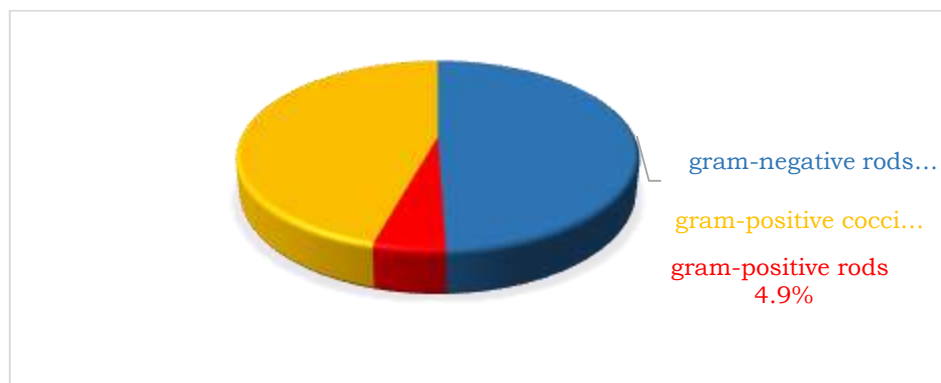
Results and discussion: In this study, 80 cotton swabs were collected from all the targeted bathrooms in the study from the steam room, walls, ceilings and floor, where strains samples were isolated 182.

Table (1): Total colony counts

Places	Sample	Steam room	Roof	Wall	Floor	Cfu/1ml
S1		40 (10%)	5 (5%)	141 (35.3%)	213 (53.3%)	399 (32.7%)
U2		9 (2.2%)	64 (16%)	39 (9.7%)	287 (71.9%)	399 (32.7%)
W3		3 (8.5%)	1 (2.8%)	8 (22.8%)	23 (65.7%)	35 (2.8%)
S4		27 (7%)	34 (8.8%)	71 (18.4%)	253 (65.7%)	385 (31.6%)
TOTAL		79 (6.4%)	104 (8.5%)	259 (21.2%)	776 (63.7%)	1218 (100%)

The results of Table (1) showed that the isolation of bacteria from the environment of some of the steam baths in Tripoli, the highest incidence of bacteria found in the floor of the steam baths, number 776 isolates and 63.7%, and may be due to waterfalls and body secretions visitors, Steam baths and their tools may be the reason for the transfer of bacteria. This is consistent with [27] which found the number of bacteria on the floor of the Diwanayah hospital in Iraq compared to the rest of the other samples, the total number of bacteria isolated from the walls was 259 21.2%, followed by the roof with 104 isolates and 8.5% Steam room with 79 isolates 6.4%. The presence of bacteria in these places may

be more due to higher temperatures and humidity in the steam room than elsewhere. It was noted that the highest isolation of bacteria from the environment of bathrooms S1 and U2 399 isolation 32.7%, might be due to lack of cleanliness and the presence of dust. Followed by bath S4 where bacterial isolates reached 385 (31.6%). It was noticed that the lowest number of isolates was from the W3 steam bath with 35 (2.8%). It was observed that the temperature in the W3 steam bath reached 39 ° C and a relative humidity of 84%, which may explain why bacterial contamination in the steam baths environment has decreased, as well as periodic hygiene.

**Figure (1):** Percentage of bacteria corned to gram stain.

As shown in Figure (1), the number of isolates of gram-negative rods is higher than the other, and this is consistent with [19]. This is evidence of bacterial intestinal dominance in these places and

some of them cause diseases if appropriate conditions [28] with 46% of the natural bacteria on the skin and hair are also found in water, dust and soil [29].

Table (2): The number the identified species in the steam baths

Name bacteria	Steam bath	Roof	Wall	Floor	Number	%
<i>Escherichia coli</i>	+	+	+	+	54	29.7
<i>Staphylococcus epidermides</i>	-	+	+	+	33	18.1
<i>Staphylococcus aureus</i>	-	+	+	+	28	15.4
<i>Micrococcus luteus</i>	-	-	-	+	17	9.3
<i>bacillus brevis</i>	-	-	-	+	9	4.9
<i>Edwardsiella tarda</i>	-	+	+	-	8	4.4
<i>Aeromonas hydrophila</i>	-	-	-	+	7	3.8
<i>Vibrio alginolyticus</i>	-	+	-	+	6	3.3
<i>Plesiomonas shigelloides</i>	+	-	-	+	5	2.7
<i>Salmonella choleraesuis</i>	+	-	-	+	5	2.7
<i>Micrococcus roseus</i>	-	-	-	+	4	2.2
<i>Xanthomonas maltophilia</i>	-	+	+	-	3	1.6
<i>Shewenella putrefaciens</i>	-	+	-	+	3	1.6
Total					182	100%

The results of Table 2 showed that *Escherichia coli* was the most common occurrence of 29.7%. It corresponds to the results of [30]. It is a group of intestinal bacteria, which is found inside the intestines naturally and if it is present outside the intestine causes diarrhoea and vomiting, It is considered to be a guide to pollution, and it accounts for 50% of the causes of UTIs [31] *Staphylococcus epidermide* are found in 26.4% of microorganisms that naturally occur on the skin [32] *Staphylococcus aureus* represents 20.7% of the total isolated specimens that are found on the body *Plesiomonas shigelloides* found in human feces, and in warm environments, *Vibrio alginolyticus* Consumers and physicians should be aware that marine and animal, animal products that are treated in a non- Can be a source of microbial infection. Especially in shrimp and oysters caught from warm coastal waters as they are natural flora of these areas and in marine habitats of these waters [33-35] *Edwardsiella tarda* bacteria are widely found all over the world, found in Japanese waters and were present in the Japanese eel and also in the United States found to be found in human feces [26], *Aeromonas hydrophila* where they determine their presence in people dealing with Aquatic environments such as fishers and others [35] *Plesiomonas shigelloides* are present in soil and water environments, in warm and cold blood cells, and infection is caused by gastrointestinal contamination by consumption of raw fish or water-contaminated foods [36]. *Shewenella putrefaciens* are present in the environment of lakes, estuaries and soil, responsible for the smell of rotten fish, and they occur repeatedly through the skins of people connected to water, especially when the wounds and sores occur [37] [38].

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