



## Sensitivity of some types of Gr+ and Gr- bacteria to some types of commercial soaps

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**Keywords:** sensitivity test, detergent, gram-positive bacteria, gram-negative bacteria, antibacterial agents.

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### Abstract:

The use of soap is one of the most important means of ionic cleansing and getting rid of some types of bacteria that may be harmful and present on the skin, especially after using the toilet, as part of them may remain on the surface of the skin, causing some pathological injuries, and the ability of soap to remove or eliminate these germs varies according to the soap type and the period of its use in washing, the study aimed to determine the ability of some types of liquid soap to eliminate different types of Gram-positive and gram-negative bacteria.

The plate method was used to find out the sensitivity of each of the types of bacteria (Klebsiella, E.coli Staph aureus, Pseudomonas, Streptococcus,) towards types of liquid soaps produced by international companies, including Bivy, Dettol, ActiveX, Lifebuoy, Oud, using the tablet method, and it was determined The minimum inhibitory concentration for each type of liquid soap (depending on the bacterial species used). Klebsiella E.coli showed high sensitivity to Dettol soap, while Pseudomonas and Staph aureus bacteria showed high sensitivity to Bivy soap. Streptococcus bacteria appeared to be highly sensitive to Lifebuoy soap, and the sensitivity of bacterial species to the rest of the soaps varied between medium and weak.

**Keywords:** sensitivity test, detergent, gram-positive bacteria, gram-negative bacteria, antibacterial agents.

## حساسية بعض أنواع البكتيريا الموجبة والسالبة لصبغة كرام تجاه أنواع من الصوابين التجارية

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### الخلاصة:

يعد استخدام الصابون من أهم الوسائل للتطهير الأيوني والتخلص من بعض أنواع البكتيريا التي قد تكون ضارة والمتواجدة على الجلد وخاصة بعد استخدام التواليت إذ قد يتبقى جزء منها على سطح الجلد مما يسبب بعض الإصابات المرضية، وتختلف قدرة الصابون على إزالة تلك الجراثيم أو القضاء عليها حسب نوع الصابون وفترة استخدامه بالغسل، هدفت الدراسة الى تحديد قدرة بعض أنواع الصابون السائل على القضاء على أنواع مختلفة من البكتيريا الموجبة والسالبة لصبغة كرام.

تم استخدام طريقة الأطباق لغرض إيجاد حساسية كل من أنواع البكتيريا *Klebsiella* , *E.coli Staph aureus*, تجاه أنواع من الصوابين المنتجة السائلة من شركات عالمية ضمت *Bivy*, *Dettol*, *Pseudomonas*, *Streptococcus*. وذلك باستخدام طريقة الأقراص، وتم تحديد التركيز المثبط الأدنى لكل نوع من الصوابين السائلة (على الأنواع البكتيرية المستخدمة). وظهرت كل من بكتيريا *Klebsiella E.coli* بحساسية عالية تجاه صابون *Dettol* في حين ظهرت بكتيريا *Pseudomonas*, *Staph aureus* بحساسية عالية تجاه صابون *Bivy* ظهرت بكتيريا *Streptococcus* بحساسية عالية تجاه صابون *Lifebuoy* ، وكانت حساسية الأنواع البكتيرية لباقي أنواع الصوابين متفاوتة بين متوسطة وضعيفة.

**الكلمات المفتاحية:** اختبار الحساسية، مطهر، البكتيريا الموجبة لصبغة كرام، البكتيريا السالبة لصبغة كرام، العوامل المضادة للبكتيريا.

### 1. Introduction:

As the body's initial line of defense, skin contains most of the bacteria that cause skin infections, including *Pseudomonas aeruginosa* and *Staphylococcus aureus*. According to health care professionals, hand washing with antibacterial soap is particularly crucial since it may be the primary source of bacterial contamination from infections or opportunistic germs. [1-2]. *Staphylococcus aureus* and other gram-negative bacterial species cause pyogenic skin infections, and soaps include active chemicals that are both antibacterial and have reducing action. [3]. According to studies, antibacterial soap removes bacteria more effectively than regular soap [4]. There is a wide variety of chemicals that may kill germs and prevent their development. There may be as many as 10,000 different compounds, with just around 1,000 of them seeing regular usage in healthcare facilities and private residences. All three of those states

are possible for these chemical substances. There are several classes of compounds used to kill or inhibit microorganisms.

When it comes to stopping the spread of disease, few things have been as useful as detergents, which are chemicals with both lipophilic and hydrophilic components that can kill or inhibit the growth of microorganisms on inanimate objects. Soap is a chemical molecule formed when fatty acids, oils, and salt mix [5, 6]. Soap, liquid hand-wash, detergent, etc. are only a few examples of the many cleaning chemicals that have been in use for centuries all around us. For decades, antibacterial soaps have been helping people keep their hygiene in check. Some antibacterial soaps can eradicate as much as 85% of germs from the skin with a single use. [7]. It was recommended in a 1961 report by the U.S. Public Health Service that Before and after having contact with customers, staff members spend one to two minutes using soap and water. When it comes to healthcare providers, hand hygiene is of the utmost importance because of the prevalence of harmful and opportunistic microorganisms in the workplace [8].

Products with antimicrobial components are referred to as "antiseptics" because of their ability to prevent the spread of bacteria and other pathogens. Antimicrobials are available without a prescription and fall under this category. Their usefulness and safety are legal in the United States according to the Food and Drug Administration. Antibacterial soaps, hand washes, body washes, sanitizers, surface sprays, and mouthwashes are only some of the consumer antiseptic medication items available in stores today [9]. Chloroxylenol, triclosan, and triclocarban are some of the active components in these products, and the US Food and Drug Administration [10] names them as active ingredients in over-the-counter antiseptics, but further study is required to confirm their safety and effectiveness. Antiseptic body washes and other consumer antiseptic products get heavy daily use [11]. That's why it's so important to track how well this product works so we can keep an eye out for any signs of a resistance pattern developing over time. [11]. Soaps containing antimicrobial compounds are another option, although those without are the most common. Medicated soaps feature antimicrobial chemicals in addition to the soap base [12]. Microorganisms may be found almost anywhere in the air, water, soil, and rock, as well as in plants, animals, and people [13], and they play an essential role in maintaining human health [14]. Bacteria from the environment, both Gram-positive and --negative, may cause skin infections when they settle on the skin's surface [17].

## 2. Material and methods :

The work was done in the Department of Biology College of Science University of Mosul and used the disc method to process different soaps to types of bacteria [15].

- 1 -Sample Collection: Five types of liquid soap have been prepared from different international origins available in the local markets, namely Dettol soap, Activex, Lifebuoy, Bivy, and Oud. Use the double dilution method by taking 1 ml of liquid soap and adding 9 ml of distilled water. Several concentrations: 1/2, 1/4, 1/8, 1/16, 1/32. it was sterilized in a water bath at 80°C for 1/2 hour.
- 2 -Bacterial use: The bacterial used were obtained from postgraduate students in the department and were previously diagnosed and included *E.coli*, *Klebsiella sp*, *Pseudomonas sp*, *Staph aureus*, *Streptococcus sp* was isolated on Nutrient agar (N.a).
- 3 -Paper discs: Prepared from What Man No. 1 filter paper, 100 tablets were dispensed into a vial and sterilized in an autoclave at 121 and 15 degrees for 15 minutes, then 10 ml of the prepared dilution of liquid soap was added so that each tablet was saturated with 100 µl. They were sterilized by pasteurization in a water bath at 80°C for half an hour.
- 4 -Bacterial activity: Bacteria were cultured on a Nutrient agar medium. Distribute the bacteria evenly on the plate by swab. The tablets saturated with soap were placed in the dish at equal and appropriate distances and incubated at 37 °C for 24 hours and then read by measuring the inhibition zone. Each experiment was repeated three times.

### 3.Results and discussion:

The effect of liquid soaps of international origin was tested on five species of bacteria, including Gr<sup>+</sup> and Gr<sup>-</sup>, and the preliminary results were shown in the following table.

**Table 1: Inhibitory effect of liquid soaps on gram-positive and negative bacteria**

| Bacteria type            | Oud/mm | Bivy/mm | Lifebuoy/mm | Activex/mm | Dettol/mm |
|--------------------------|--------|---------|-------------|------------|-----------|
| <i>E.coli</i>            | 15     | 17      | 25          | 21         | 23        |
| <i>Klebsiella sp.</i>    | 14     | 13      | 17          | 14         | 19        |
| <i>Pseudomonas sp</i>    | 23     | 40      | 30          | 18         | 32        |
| <i>Staph aureus</i>      | 20     | 27      | 25          | 14         | 24        |
| <i>Streptococcus sp.</i> | 15     | 11      | 29          | 22         | 22        |

The results showed an inhibitory effect of (Dettol) liquid soap at a concentration of 1/2 on each of (*E.coli*, *Klebsiella sp*, *Pseudomonas sp*, *Staph aureus*, *Streptococcus sp*) Inhibitory diameters amounted to 23 mm, 19 mm, 32 mm, 24 mm, and 22 mm, respectively; the highest effect was on the bacteria *Pseudomonas*. The effect of (Activex) soap appeared at a concentration of 1/2 to highly inhibit specially *Streptococcus* in diameter 22 mm Also, the results showed an inhibitory effect of (Lifebuoy) liquid soap at a concentration of 1/2 on bacteria, (*E.coli*, *Klebsiella sp*, *Pseudomonas sp*, *Staph aureus*, *Streptococcus sp*) Inhibitory

diameters amounted to 25mm, 17mm, 30mm, 25mm, 29mm respectively, the highest effect was on bacteria *Pseudomonas*.

Also, *Pseudomonas* bacteria were highly sensitive to each of Bivy and Oud soap, with inhibition diameters of 40 mm and 23 mm, respectively, while type of the bacteria showed lower inhibition diameters from both types of soap.

**Table 2: the minimum inhibitory concentration of E.coli bacteria for the types of soaps used Dilutions.**

| Soap type       | Dilutions/mm |     |     |      |      |
|-----------------|--------------|-----|-----|------|------|
|                 | 1\2          | 1\4 | 1\8 | 1\16 | 1\23 |
| <b>Dettol</b>   | 23           | 21  | 18  | 16   | -    |
| <b>Activex</b>  | 21           | 18  | 13  | 11   | -    |
| <b>Lifebuoy</b> | 25           | 19  | 9   | 7    | -    |
| <b>Bivy</b>     | 17           | 12  | 8   | -    | -    |
| <b>Oud</b>      | 15           | 10  | 8   | -    | -    |

When tested on *E. coli* bacteria, the MIC for Dettol soap was at a dilution of 1/32, whereas the MICs for Activex and Lifebuoy soap were at a dilution of 1/16. Bivy and Oud soaps showed a MIC against *E. coli* at a dilution of 1/8. These results show that the effect of Dettol soap was higher than other types of soaps on *E. coli* bacteria, followed by Activex and Lifebuoy soaps, while the effect of Bivy and Oud was less on the same bacteria.

**Table 3: the minimum inhibitory concentration of Klebsiella sp bacteria for the types of soaps used.**

| Soap type       | Dilutions /mm |     |     |      |      |
|-----------------|---------------|-----|-----|------|------|
|                 | 1\2           | 1\4 | 1\8 | 1\16 | 1\23 |
| <b>Dettol</b>   | 19            | 6   | -   | -    | -    |
| <b>Activex</b>  | 14            | 9   | 7   | -    | -    |
| <b>Lifebuoy</b> | 17            | 16  | 11  | -    | -    |
| <b>Bivy</b>     | 13            | 9   | -   | -    | -    |
| <b>Oud</b>      | 14            | 13  | 7   | -    | -    |

The *Klebsiella* bacteria appeared with a high resistance to the most used types of soap, as the MIC appeared to Dettol soap at a dilution of 1/4, while the MIC of active soap appeared at a dilution of 1/8, and the MIC of Lifebuoy soap appeared at a dilution of 1/8. Likewise, the MIC of Bivy soap appeared on *Klebsiella* sp at a dilution of 1/4, while the MIC of Oud soap appeared at a dilution of 1/8.

**Table 4: the minimum inhibitory concentration (MIC) of Pseudomonas sp for the types of soaps used.**

| Soap type | Dilutions/mm |     |     |      |      |
|-----------|--------------|-----|-----|------|------|
|           | 1\2          | 1\4 | 1\8 | 1\16 | 1\23 |
| Dettol    | 23           | 16  | 14  | 12   | -    |
| Activex   | 18           | 20  | 18  | 15   | 12   |
| Lifebuoy  | 30           | 18  | 15  | 12   | 18   |
| Bivy      | 40           | 10  | 8   | 7    | -    |
| Oud       | 23           | 15  | 10  | 8    | -    |

Pseudomonas bacteria appeared with average sensitivity to the types of soaps used, as the mic appeared Dettol soap at a dilution of 1/16, while the MIC of Activex soap at a dilution of 1/32, and the MIC of Lifebuoy soap appeared at a dilution of 1/32. Likewise, the MIC of Bivy soap appeared on Pseudomonas sp at a 1/16 dilution, while the MIC of Oud soap appeared at a 1/16 dilution.

**Table 5: the minimum inhibitory concentration (MIC) of Staph aureus bacteria for the types of soaps used.**

| Soap type | Dilutions /mm |     |     |      |      |
|-----------|---------------|-----|-----|------|------|
|           | 1\2           | 1\4 | 1\8 | 1\16 | 1\23 |
| Dettol    | 24            | 11  | 9   | -    | -    |
| Activex   | 14            | 9   | -   | -    | -    |
| Lifebuoy  | 25            | 14  | 9   | -    | -    |
| Bivy      | 27            | 10  | -   | -    | -    |
| Oud       | 20            | 14  | 11  | -    | -    |

The Staph aureus bacteria had more resistance to soap types than the while type of the bacteria, as the mic appeared Dettol soap on Staph aureus at a dilution of 1/8, while the MIC of Activex soap appeared at a dilution of 1/4, and the MIC of Lifebuoy soap at a dilution of 1/8. Likewise, the MIC of Bivy soap appeared on Staph aureus at a dilution of 1/4, while the MIC of Oud soap appeared at a dilution of 1/8.

**Table (6) the minimum inhibitory concentration of Streptococcus sp. for the types of soaps used.**

| Soap type | Dilutions /mm |     |     |      |      |
|-----------|---------------|-----|-----|------|------|
|           | 1\2           | 1\4 | 1\8 | 1\16 | 1\23 |
| Dettol    | 22            | 16  | 12  | 8    | -    |
| Activex   | 22            | -   | -   | -    | -    |
| Lifebuoy  | 29            | 20  | 15  | 15   | 11   |
| Bivy      | 11            | 8   | -   | -    | -    |
| Oud       | 15            | 12  | 9   | 9    | -    |

Our results in **Table (1)** agreed with the results of the scientist Ecor in 2018 [16] and the scientist Bashir in 2018 [17] on the effect of Dettol soap on different types of bacteria.

The results of **Table (2)** agreed with the results of the scientist Ishur T. In Nigeria in 2018 [16] and the scientist Bashir in Algeria in 2018 [17] and the scientist Abbas in Pakistan in 2016 [18] about the effect of Dettol soap on different types of bacteria, where the study concluded that according to our results, the width of the inhibitory zones increased with increasing amount or concentration of liquid soap applied. The above-mentioned inhibition diameters appeared with increasing concentration.

The results of **Table (3)** also agreed with the results of the scientist EcoR in 2018 [16] on the effect of Dettol soap on different types of bacteria, as the study concluded that the diameters of inhibition increase with the increase in the volume or concentration of the liquid soap added, and this is consistent with our results, as the diameters of inhibition appeared the above inhibition increases with increasing concentration .

The results of **Table (4)** are consistent with the results of the scientist Ecore T. In Nigeria in 2018 [16] and the scientist Bashir in Algeria in 2018 [17] about the effect of Dettol soap on different types of bacteria. Above with increasing concentration .

The results of **Table (5)** agreed with the results of the scientist Ecore T. In Nigeria in 2018 [16], the scientist Bashir in Algeria in 2018 [17], and the scientist Abbas in Pakistan in 2016 [18] about the effect of Dettol soap on different types of bacteria, where the study concluded that the diameters of inhibition increase with the increase in the volume or concentration of the added liquid soap. This is consistent with our results, as the inhibition diameters appeared higher with increasing concentration .

The results of **Table (6)** agreed with a study conducted by the scientist Ishur T. In Nigeria in 2018 [16], scientist Bashir in Algeria in 2018 [17], and scientist Abbas in Pakistan in 2016 [18] about the effect of Dettol soap and Lifebuoy soap on different types of bacteria. The diameters of inhibition are higher depending on the concentration, or proportionally to the amount of soap used the species Streptococcus showed high sensitivity to each of Oud, Life, and Dettol soaps, as the MIC appeared for each of them at a dilution of 1/32, while it appeared for the whole type of the soaps with an amount of 0 respectively .

#### **4. CONCLUSION:**

The ability of soap to remove or eliminate harmful bacteria varies depending on the type of soap and how long it is used for washing. Using soap is one of the most important ways to achieve ionic cleansing and get rid of some types of bacteria that may be present on the skin, especially after using the restroom. Some of these germs may remain on the skin's surface and

cause pathological injuries. the bacterial species used). Klebsiella E.coli showed high sensitivity to Dettol soap, while Pseudomonas and Staph aureus bacteria showed high sensitivity to Bivy soap. Streptococcus bacteria appeared to be highly sensitive to Lifebuoy soap, and the sensitivity of bacterial species to the rest of the soaps varied between medium and weak .

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