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The Effect of a Hollow Neodymium Magnet on the Growth of Aeruginosa Pseudomonas and Staphylococcus Lentus

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Abstract: Both negative and positive bacteria (Aeruginosa pseudomonas and Staphylococcus lentus) were utilized to study the effect of a hollow neodymium magnet on their bacterial growth. The two bacterial species were grown on separate agars (nutrient and MacConkey). The magnet's strength is 70 milliTesla. Plates with negative and positive bacteria were initially exposed to the magnet.
We repeated the experiment with three magnets this time. It was shown that the North Pole of the used magnet affected the growth of negative bacteria more than it did that of South Pole bacteria, while positive bacteria were unaffected. In MacConkey agar, the magnet's magnetic field has a definite effect. Every outcome was contrasted with the outcomes obtained without the use of magnets, demonstrating that the use of three magnets increases the impact of the magnet.

1. Introduction

The fast development of microorganisms poses a severe concern in the healthcare, food, and industrial industries, and this severe care is focusing on finding new ways of fighting these microorganisms. One of these ways is to use a magnetic field to see if it weakens or kills microorganisms. Research on the impact of magnetic fields on living beings did not begin until the late 1800s, then intensified in the subsequent decades after worldwide electrification. Also, there is an important reason to study the effect of magnetic field on microorganisms (1-2)
The widespread use of communication technologies powered by electricity, magnetism, and electromagnetism raises concerns about their impact on public health and the environment. The literature covers a wide range of topics, including field type and strength, duration of exposure, long- and short-term impacts, and biological targets (cells, tissues, organs, and organisms). More studies can improve our understanding of certain conditions, such as whether electromagnetic fields tend to boost rather than reduce cell activity (3-5)
More questions are asked about the effects of magnetic fields on bacterial growth and whether they can manipulate cells due to the fact that living things are electromagnetic systems and the magnetic field influences the ionic movement of materials. One of the most important results found after several studies is that the final velocities of bacteria in liquid media are substantially influenced by the strength and direction of the field, and the number of microorganisms was significantly reduced (7-8)
Magnetic fields are expected to produce mild to minor effects, and this is true for a brief exposure period in which weak fields cause a small disturbance but no major effect. It is repeated several times, and the change in field affects the dynamics of the bacteria (9-10)
A weak magnetic field can also impede bacterial growth, even after removal. They are the principal cause of damage to cell constituents such as DNA and protein. Fortunately, the magnetic field was not as effective against human cells as it was against bacteria (11-12)
This study aims to explore the impact of using low magnetic field on some bacteria by using neodymium magnet.

The experimental details

A hollow neodymium magnet was used to study bacterial growth. Both negative and positive bacteria (Aeruginosa pseudomonas and Staphylococcus lentus) were utilized. The two bacterial species were grown on separate agars (nutrient and MacConkey). The magnet's strength is 70 milliTesla. Plates with negative and positive bacteria were initially exposed to the north magnetic pole. These steps were carried out using the same magnet's South Pole, which is critical for understanding how altering the magnetic pole affects the growth. Another goal of this research is to investigate how increased magnetic strength influences bacterial growth.

We utilized two and three magnets of the same type to achieve that purpose and compared the bacterial growth under the effect of a single magnet. The reported data of using one, two, and three magnets were compared to those obtained in the absence of magnesium.
Figure 1 shows the main steps of the above-mentioned procedure.

Figure 1 shows the steps in the use of magnets and their effect on bacterial growth.

2. Results and Discussion

Figures 2 and 3 illustrate how the utilized magnet affects bacterial growth in Macconkey agar. Figure 1, which depicts the bacterial development of the negative bacterium pseudomonas Aeruginosa in the presence of the magnet's North Pole versus the absence of neodymium magnets, shows that this magnet has a clear effect on bacterial growth.

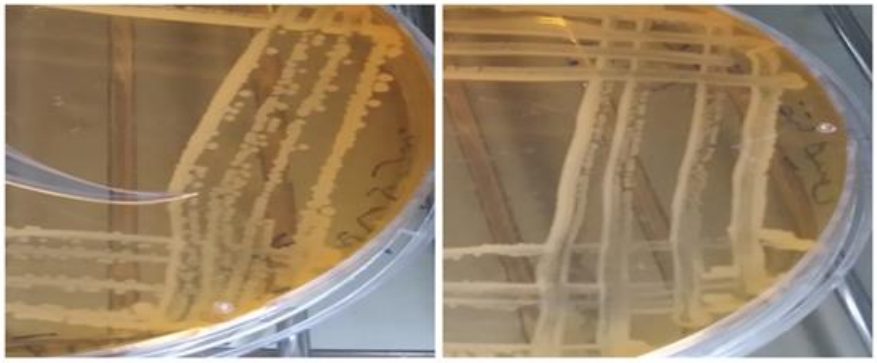

Figure 2 the growth of pseudomonas aeruginosa in the presence of the magnet's North Pole versus the absence of neodymium magnets

The figure 2 shows the effect of one pole of a magnet with its south pole facing the plate of pseudomonas aeruginosa, but this time in the centre of the nutrient agar. We notice that there is little bacterial growth for the dishes with magnets on top, while there is heavy bacterial growth for plates that do not have magnets.

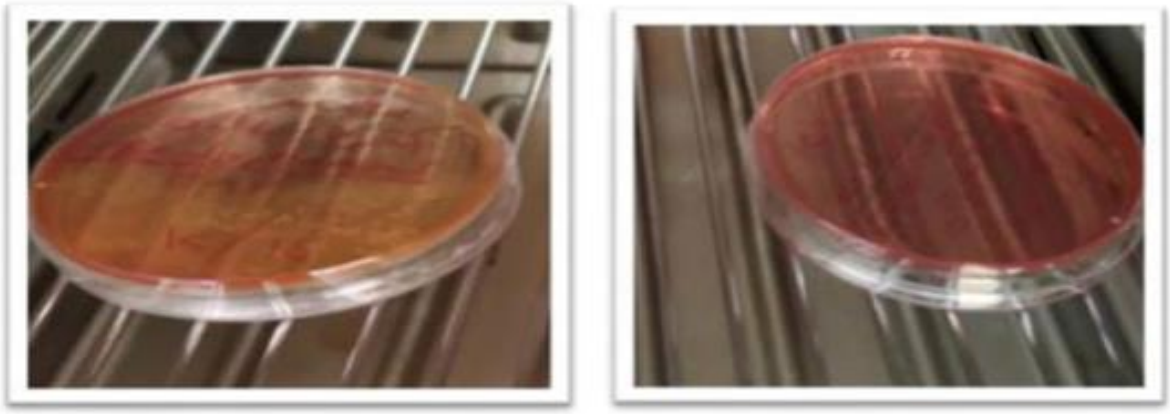

Figure 3 the growth of pseudomonas aeruginosa in the presence of the magnet's South Pole versus the absence of neodymium magnets

As mentioned before, we used another type of agar to know if the effect of the magnetic field depends less on the agar type, and for this purpose, we used nutrient agar. All the below cases of bacterial growth are one by using nutrient agar.
By monitoring the bacterial growth of Staphylococcus lentus revealed no change in growth between the first two cases with and without the impact of the magnet's North Pole. Figure 4 depicts the lack of any variations in the growth.

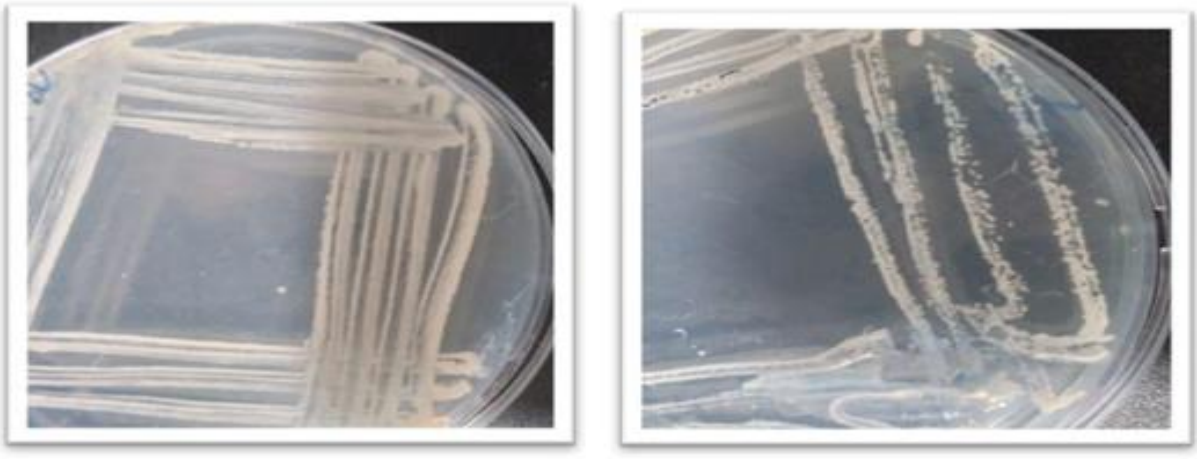

Figure 4 the growth Staphylococcus lentus in the presence of the magnet's North Pole versus the absence of neodymium magnets

This growth manner with no magnet effect is also recorded and shown in figure 5 for the pseudomonas aeruginosa in the presence of the magnet's South Pole versus the absence of neodymium magnets in nutrient agar.

Figure 5: Growth pseudomonas aeruginosa in the presence of the magnet's South Pole versus the absence of neodymium magnets in nutrient agar.

We also tested how the magnet's south poles influenced the growth and development of pseudomonas aeruginosa. Figure 6 depicts the growth where there is no discernible difference in bacterial growth, whether magnets are present or not.

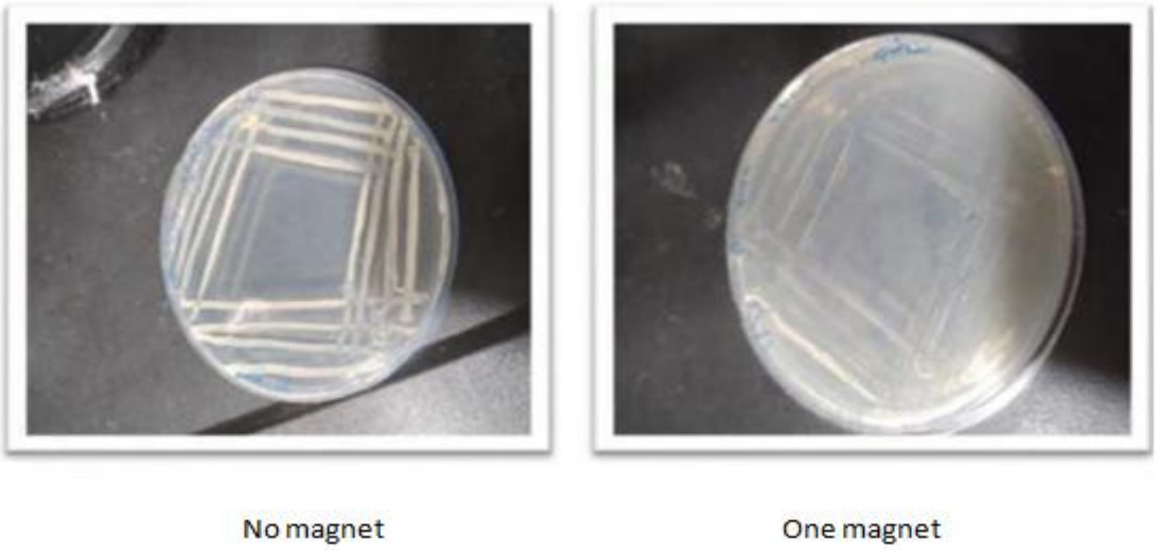

Figure 6: Growth of Staphylococcus lentus in the presence of the magnet's South Pole versus the absence of neodymium magnets in nutrient agar.

Figure 7 depicts the impact of the North Pole on the growth of Aeruginosa pseudomonas. We have a little bacterial growth, and the colonies are large in proportion to the dishes on which the magnet is facing. It is denser for the bacteria, with smaller and more numerous colonies. This shows that magnets have a detrimental impact on bacterial development. A distinct effect on colony size, as the form of the colony increases in the presence of magnets, but the number of colonies decreases. In the absence of magnets, the number of colonies increases, but they become smaller.

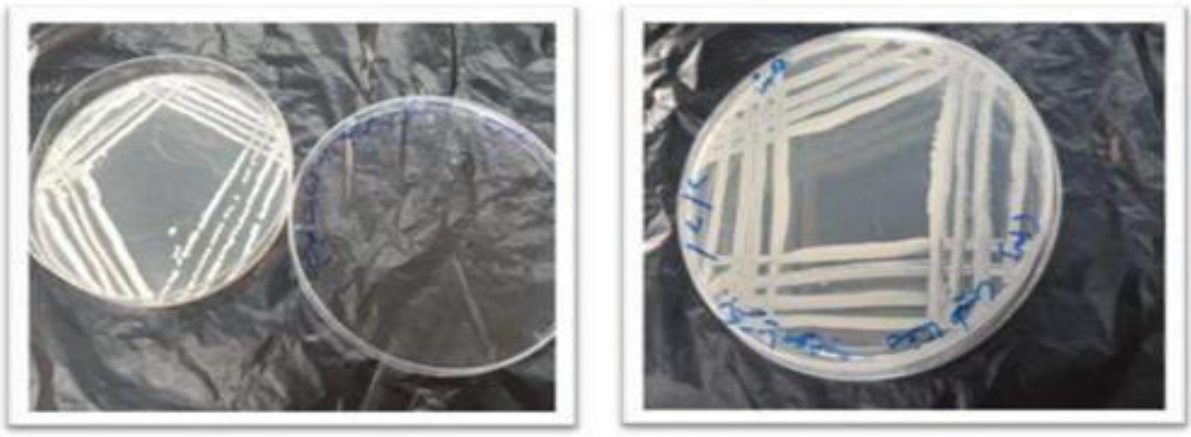

Figure 7: Growth of pseudomonas aeruginosa in the presence of the magnet's North Pole versus the absence of neodymium magnets in nutrient agar.

As is the case in the study of the effect of the north pole of a single magnet, the study continued to include the effect of the north pole of three magnets, but this time using either Nutrient a or MacConkey agar. There is very little growth of bacteria on top of the magnet, while there is heavy growth in the dishes in the absence of any magnet effect, which indicates that the effect of one magnet is clear on the whole group of more than three magnets of the same type. The last effect is noticeable evidence of the bacterial response to the magnetic fields as shown in figures 8 and 9.

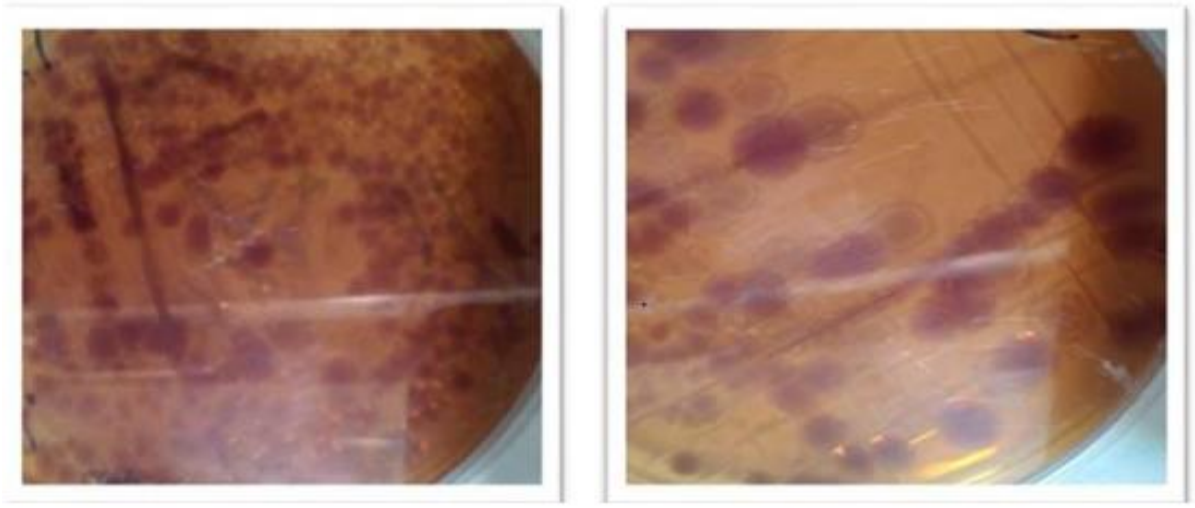

Figure 8: the effect of three magnets on the growth of Staphylococcus lentus in the presence of the North Pole versus the absence of neodymium magnets in MacConkey agar.

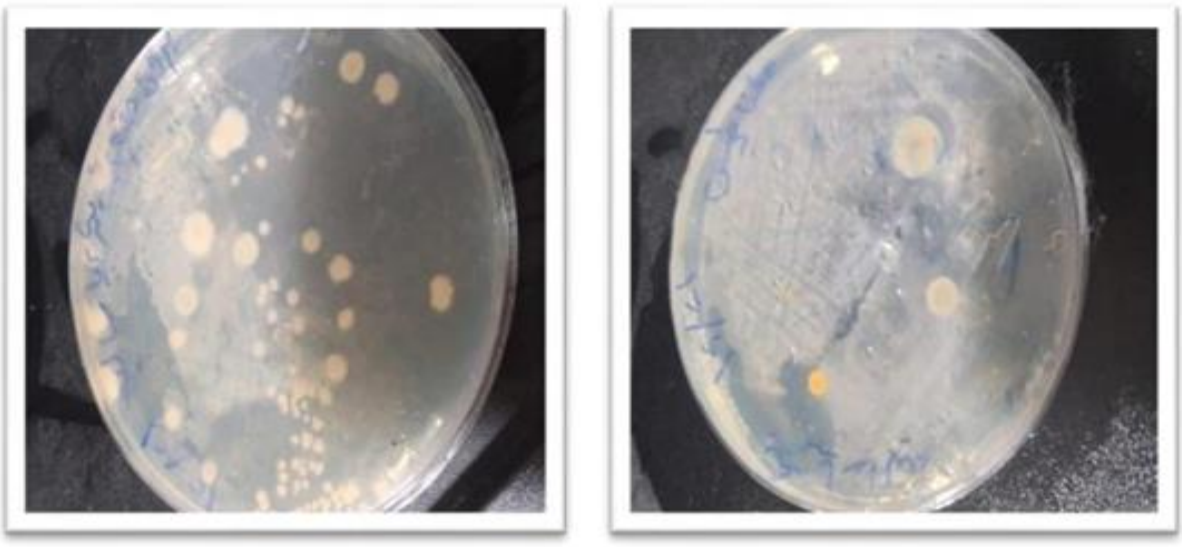

Figure 9: the effect of three magnets on the growth of Staphylococcus lentus in the presence of the North Pole versus the absence of neodymium magnets in nutrient agar.

These changes in the proportions and patterns of bacterial growth, whether of negative or positive bacteria, and under the influence of the magnetic field applied by a hollow magnet, and the current change due to changing the magnetic pole strongly demonstrates the ability of the magnetic field to affect some types of bacteria, and this effect is not comprehensive for all types due to the difference in composition. The cell wall, which largely determines the mechanism of whether this bacteria responds or does not respond to this magnetic force, as the microscopic study of the form of bacterial growth shows that the bacteria growing on the borders of the colony are as if they were making a kind of sacrifice or wall protecting the borders of this colony and crossing over to form a barrier that acts on the field of matter that is needed or It weakens the magnetic field and thus affects a small number of bacteria, not the entire colony. This is why there is intermittent growth of bacteria under the influence of magnets, especially the North Pole, which showed a more pronounced effect on bacteria than the South Pole.

3. Conclusion

We infer from the preceding that the magnetic field influences the development and spread of bacteria and that this impact changes. By varying the intensity of the magnetic field, this impact relies on the kind of bacteria, whether negative or positive. This phenomenon can be harnessed in the future to develop gadgets that destroy germs or prevent growth. Bacteria exist in all mediums.

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