[Images of Dishes](http://docs.google.com/DISH1.HTM)

[Data Table](http://docs.google.com/table.htm)

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|  | | | | | | | | | | | | | | | Results and Discussion:  In the first set of experiments the zones of inhibitions caused by various concentrations of garlic over a period of four days were measured. Initially the concentrations of garlic were determined using percentages in volume of the garlic juice, but later, in order to have a valid comparison with the antibiotic results, the percentages were converted to concentrations having the units of mg/ul. However, it was not possible to find the true concentrations of garlic because the fraction of the garlic juice that contained the active ingredient was unknown. In the antibiotics, all were the active ingredients. Also, it was difficult to dilute the garlic juice since it is only semi-soluble in water. The organic mixture that garlic could be dissolved in was not obtainable. Despite the problems using and experimentally measured density, the concentrations were found. They ranged from 0 mg/ul to 1.45 mg/ul. The results are seen on the following chart and graph (figure 1 and table 1).  Figure 1: Graph of the average inhibition zones produced by garlic in the first four days  Table 1: Shows the variation in zones of inhibition produced by garlic in the first four days     |  |  |  |  |  | | --- | --- | --- | --- | --- | | Concentration  (mg/ul) | Day 1 Avg  Inhibition zone (mm) | Day 2 Avg  Inhibition zone (mm) | Day 3 Avg  Inhibition zone (mm) | Day 4 Avg  Inhibition zone (mm) | | 0 | 0 | 0 | 0 | 0 | | .3625 | 18.4 | 7.6 | 7.0 | 0 | | .725 | 20.5 | 10.2 | 7.0 | 0 | | 1.0875 | 23.3 | 18.6 | 14.8 | 0 | | 1.45 | 32.1 | 29.8 | 19.6 | 0 |   These results clearly show that the concentration of garlic has an immense effect on the Zone of Inhibition produced. With a concentration of 0.3625 mg/ul, an average inhibition zone of 18.4 mm is produced while with the use of a 1.45 mg/ul concentration of garlic, a much larger average zone of inhibition (32.1 mm) is created. The data can be modeled using fourth power polynomial equations seen on the graph. By the second day, the inhibition zones of all the different concentrations dropped significantly. From the first to the second day, the inhibition zone size average has dropped the most for the samples with the lowest concentrations, and the least for the samples with the highest concentrations.The cause of this might be that most of the allicin in the lower concentrations have degenerated while there still was a significant amount of allicin left in the higher concentrations. Overall, zones of inhibition of the second day displayed to a greater extent the relationship of the higher concentration having the largest inhibition zone. By the third day the inhibition zones were again reduced. However, between the second and the third day, the inhibition zones sizes of the higher concentrations were reduced more than the inhibition zone sizes of the lower concentrations. It was noticed that the samples of the highest concentrations had approximately the same inhibition zones of the samples of the lowest concentrations in the previous day. There may be a relationship between the initial zone of inhibition and how much the zone will be reduced after a period of one day. The trend of having the most concentrated solution produce the largest inhibition zone still held true. By the fourth day, the garlicís antibacterial properties completely degenerated. The general course of the degeneration of garlicís antibacterial properties over time is shown in figure 2.  Figure 2: Graph of the deterioration of garlic's antibacterial effects over time  Using the one sample test, our data was statistically analyzed. Our results are shown on figure 3.  Figure 3: Shows results from the t test for the data of the average zones of inhibition created by garlic on the first day.  The bars next to the data points on the graph indicate our error. If the tests were to be repeated, there would be a ninety five percent chance in getting values of inhibition zones somewhere along the bar after one day of incubation.  After the garlic tests were done, the antibiotic data was collected. The concentrations used for the antibiotic tests were dissimilar to the concentrations used in the garlic tests. Instead of using 0.3625 mg/ul, .725 mg/ul, 1.0875 mg/ul, and 1.45mg/ul, concentrations of 0.0005 mg/ul, 0.001 mg/ul, 0.0015 mg/ul, and 0.002 mg/ul were used as the concentrations of antibiotic. The reason for this discrepancy was that it was impossible to dilute the antibiotic to the same concentrations as the garlic because when the antibiotic was mixed to those concentrations, they became lumps of solid putty instead of solutions. The problems with obtaining accurate measurements of concentration were again present. Erythromycin, like water is only semi-soluble in water, and the organic solvents needed to dissolve the antibiotic were not available. Even with the problems, the tests were run and the results are presented on the following graph and table (figure 4; table 2).  Figure 4: Shows the average zones of inhibitions caused by the antibiotic erythromycin after one, two and nine days  Table 2: Data of the average zones of inhibitions caused by the antibiotic, erythromycin after one, two and nine days     |  |  |  |  | | --- | --- | --- | --- | | Concentration (mg/ul) | Day 1 Avg Inhibition Zone  (mm) | Day 2 Avg Inhibition Zone  (mm) | Day 9 Avg Inhibition Zone  (mm) | | 0 | 0 | 0 | 0 | | .0005 | 29 | 24.6 | 25.2 | | 0.001 | 28.8 | 24 | 24.7 | | 0.0015 | 30.6 | 25.8 | 27 | | 0.002 | 29.9 | 24.9 | 26 |   Because we had a weekend and a few days off, we were not able to measure the inhibition zones on the third and fourth days. However, on the ninth day the inhibition zones were measured. The graph clearly shows that our data indicates that the concentration of the antibiotic does not significantly impact the resulting inhibition zone. The causes might have been because concentrations were not able to measured accurately or because of the properties of the antibiotic. From the first day to the second day, the inhibition zones were reduced slightly, but by the ninth day, the inhibition zones were larger than they were on the second day. The changes in inhibition zones over time are displayed on figure 5 below.  Figure 5: Shows the effects of time on the average zones of inhibitions caused by erythromycin  Again with the one sample t test, the ninety five percent confidence level error bar was calculated. Those results are shown on figure 6.  Figure 6: Shows results from the t test for the data of the average zones of inhibition created by the antibiotic erythromycin on the first day.  Overall, the error bars were larger with the antibiotic than the bars of garlic. This indicates that the data collected from the garlic were much more consistent than the data collected from the antibiotic.  In a comparative study the relationship between the effectiveness of the garlic and antibiotic can be seen. The following graph (figure 7) shows this.  Figure 7: A comparative study of the antibacterial effects of garlic and the antibiotic erythromycin  Because the concentrations of the antibiotics were significantly different from the concentrations of garlic, the x axis has been scaled differently for the two sets of data. For the garlic, the x axis ranges from 0 to 2.5 mg/ul, while for the antibiotic it ranges from 0 to 2.5 mg/ml, giving the scales a difference of 1000 times (the garlic has the larger scale). Using the graph, it can be seen that after one day, approximately 1.35 mg/ul of garlic creates inhibition zones similar to those created by the antibiotic. The concentration of antibiotic is not a factor since varying its concentration does not create much of a difference in the zone of inhibition that it creates. |
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*This Web Site is Best viewed with 256 or more colors.*

*For More Information about Creekwatch, please contact Eric Thiel at* [*ethiel@pleasanton.k12.ca.us*](mailto:ethiel@pleasanton.k12.ca.us)