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|  | By measuring the zones of inhibition for each herb, we were able to evaluated the herb�s effectiveness against the bacterium, *Bacillus cereus*. The tests provide evidence to show that not all close relatives of garlic in the genus Allium have efficient antibacterial properties. It can be seen that shallots, although not as effective as garlic or erythromycin, has limited antibacterial properties, while the other three substances produce little or no noticable zone of inhibition. In addition, chromatography discs soaked in higher concentrations produced larger zones of inhibition than those soaked in lower concentrations. The three substances, onion, garlic, and shallot, which reacted in our tests, all contained especially strong and irritating smell. This may be explained by the fact that in garlic, allicin, the antibacterial part of its extract, creates the strong smell.  It can be concluded that chives, leek, onion, and shallot are not effective enough to act as alternatives of antibiotics. If they *were* to be used as an antibiotic, best results could be obtained by using pure concentrations, as opposed to diluted solutions.  Results from [Table 11](http://docs.google.com/data.html) clearly show that the concentration of the juices has an effect on the zone of inhibition produced. For example, with the shallot-juice concentration of 100%, the zone of inhibition was 7.1 mm, at the 75% concentration it was 5mm, and at the 50% concentration it was 3.9mm. This demonstrates that as the concentration decreases, the effect on the zone of inhibition is also decreased. For some trials, the 75% concentration and 50% concentration was very similar, or, in some cases, the 50% concentration had a larger zone of inhibition than that of the 75% concentration. This phenomenon can be explained by the logic that as the juice concentration decreases, there are less anitbacterial substances to fight the bacteria. In other words, it has become more diluted.  The results of our test with garlic were compared to the results of Christina and Elisa�s test with garlic from last year. Since their data of concentration of the juices was converted from percentage to mg/mL, we also converted our percentage into mg/mL for clearer comparison (detailed calculations can be found in *Statistical Analysis* section). Their experiment included a time variation, which we did not; therefore, upon comparison, we only used the data which they collected on the first day --- the same time period as our experiment covered. The two results were put on the same graph in figure 2.  Figure 2: Graph of the result of garlic test from this experiment with the result of the same test from previous research.  From the graph above, we can see that the general shape of the two graphs are similar. However, the difference in the zone of inhibition can be accounted as a cause of the two different garlic bulbs being used at different time of the year. The quality of these bulbs may have varied between the two experiments, since the bulbs may be from different sources and had different level of freshness. Also, the time of the year that the experiment was performed may cause an effect. Bulbs grown in the autumn may be different than those in the spring. This factor within the experiment is hard to control. Nevertheless, since the variation between the two results are not significant, our results from our garlic test can be considered valid to compare to other test results.  Referring back to our [raw data](http://docs.google.com/data.html), it can be seen that the zones of inhibition from Trials #7-10 are generally larger than those of Trials #1-6. This can be explained because the experimental groups remained in the autoclave for a longer period of time due to the weekend schedule of our school. It can also be observed that there was a cloudy, white ring present around discs soaked in substances that were previously observed to have none or little antibacterial properties. This can be explained by the fact that instead of inhibiting the growth of Bacillus cereus, it was actually feeding on the substances. Referring back to graph 1, it can be observed that among the four new substances tested, shallots provided the best results, followed by onions, with chives and leeks having no noticable zone of inhibition.  From our experiment, there are several general statements we can conclude on:  1. Not all close relatives of garlic in the genus Allium have effective antibacterial properties against Bacillus cereus.  2. The higher concentration of the juice has a greater effect upon the bacteria.  3. Out of garlic, chives, shallot, onion, and leek, the substance with the most effective antibacterial properties against Bacillus cereus is garlic. |

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