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|  | * **Conclusion:**  Of the six substances tested for antiseptic properties - oak gall, garlic, sage, cinnamon, lavender, and ginger - three showed some degree of antiseptic action, and three did not. Of the three demonstrating antiseptic properties - oak gall, garlic, and sage - all were more effective against Escherichia coli than they were against Bacillus cereus. Both oak gall and garlic showed large zones of inhibition when tested against Escherichia coli, and moderate zones of inhibition when tested against Bacillus cereus. Sage evinced mildly antiseptic properties against Escherichia coli, but results with Bacillus cereus were inconclusive: further testing of sage against Bacillus cereus could reveal more positive results. Possibly there is a difference between what inhibits gram positive bacteria such as Bacillus cereus and what inhibits gram negative bacteria such as Escherichia coli, and sage is simply demonstrating this difference. However, such a difference was not obvious in the testing of oak gall or garlic, although Escherichia coli was more susceptible to both herbs than Bacillus cereus. Only a small amount of inconclusive evidence supported cinnamon's having antiseptic properties. Although cinnamon showed a zone of inhibition in the first trial against Bacillus cereus, it is possible that this was due to uneven streaking or other experimental error. After this first test the procedure was altered slightly to control a few lurking variables, and afterwards cinnamon never showed any sign of resistance to either bacteria. Lavender and ginger showed no evidence of antiseptic properties. Neither herb had any zones of inhibition when tested with Bacillus cereus or Escherichia coli. It is possible that the samples of both herbs were too old and consequently were sapped of any antiseptic properties contained within them, but as tested there was no proof that either has any antiseptic capacity. Since the active ingredient that causes an herb to be antiseptic is undetermined, it is quite possible that whatever ingredient restricted the growth of bacteria in oak, garlic, or sage is present only in extremely small amounts. Consequently, locating such an ingredient could be enormously useful as an antiseptic. If a piece of oak gall contains a substance that makes up one-thousandth of its' overall mass yet is able to keep Escherichia coli at bay, a bottle of such a substance would certainly be enormously useful in keeping microorganisms at bay. In conclusion, although the hypothesis stating that all herbs would show a zone of inhibition failed, this study concludes the following: * Oak gall, sage, and garlic have antiseptic properties. * There was no proof that cinnamon, ginger, or lavender have antiseptic properties, but more testing is certainly needed. * Bacillus cereus is more resistant to these herbal antiseptics than Escherichia coli. * Certain herbs do provide a viable alternative to current antiseptics.  **Recommendations for Furthering Study:** * Try an experiment focusing on whether or not tannin and herbs with high levels of tannin have visible antiseptic properties. * Test herbs further with Bacillus cereus * Are gram-negative bacteria always more susceptible to herbal antiseptics than gram-positive bacteria? Is this the same way for non-organic antiseptics? * Test different types of oak gall (from different trees) for antiseptic properties. * Do further studies on sage. Is it more damaging to Bacillus cereus than my experiment suggested? * Test lavender more extensively; the lavender used in this experiment may have been overly dried out. * Does the length an herb is dried out effect its' value as an antiseptic. This would be easiest to test with sage. I would suggest testing fresh sage versus 30-seconds dried sage versus 60-seconds dried sage, etc. * Try swabbing a surface with "antiseptic" herbs, and see how quickly bacteria regenerates. Don't try this on agar, if possible - try it on a counter top that is used daily, to see how these antiseptics would perform in real-life trials. * Test different parts of a plant (oak gall versus oak leaves versus oak bark, for example) for antiseptic or other medicinal properties. * Do a survey test with a group of volunteers, double blinded. Have half the volunteers take a placebo, have the other half take garlic or ginger pills. Is there significant statistical evidence that one group becomes ill more often? Ask for Mrs. Nash's help in designing this one. | |
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