|  |  |  |
| --- | --- | --- |
|  |  | |
|  | |  |  |  | | --- | --- | --- | | **Introduction**  ***Problem***  Interest in herbs is growing beyond their use as food flavorings. They have become the subjects of great interest for the possible medicinal or health benefits they might possess. Science and the health industry are exploring naturally occurring substances, looking for plants or their constituents that provide health benefits or cures. Other elements of the health industry are selling herbal remedies for many ailments, basing their claims on traditional medicinal lore and older books called "herbals" whose scientific basis may be questionable. An industry has blossomed, promising relief from all manner of afflictions - from headaches to depression to arthritis - by the ingestion or application of herbal powders or teas. At almost any library or book store entire shelves of books can be found which describe "medicinal" herbs and the medical benefits associated with their use. How can someone interested in using these herbs be certain that they are, in fact, beneficial to his or her health?  As recently as March 19, 2000, an exposÍ titled "Jeopardy in dietary substances" by Guy Gugliotta, was published in the Sunday Times. Within the article, Gugliotta asserts, "Mounting evidence suggests that increasing numbers of Americans are falling seriously ill or even dying after taking dietary supplements that promise everything from extra energy to sounder sleep." The claims of the herbal industry may be tainted with self interest. Independent experimental research is required in order to ascertain whether or not herbs have the claimed properties.  One important class of medicinal chemicals is antiseptics. This is a time of rapidly mutating bacteria and "super bugs" such as that responsible for the outbreak of tuberculosis in Russia. Time-honored antiseptics are becoming less effective, and new solutions are needed for cleansing areas of bacteria. A possible source of new antiseptic substances is naturally occurring plants and herbs. Herbal remedy books list certain herbs as having antiseptic properties. Are they accurate? Scientific work needs to be done to evaluate plants and plant components to determine whether they make useful antiseptics.  ***History of Remedies Tested in Experiment***  **Oak**  (*Quercus Robur)* has long been used for its medicinal properties. Native Americans used oak bark and acorns to treat ailments such as diarrhea and dysentery. Druids regarded the oak as sacred, and it was valued in European herbal medicine for its astringent bark, leaves, and acorns; folk medicine used oak as a treatment for gastritis, tuberculosis, and other ailments. Common medicinal uses for oak still in effect today include use as a gargle for sore throats and lotion or ointment for skin problems. Oak is composed of tannins, gallotannins, allagic tannins, monomeric and dimeric catechins and leucocyanidins. Simon Y. Mills claims that high levels of tannin are completely antiseptic, and herbs with high levels of acrid constituents and resins are the most likely to control microorganisms by contact. Oak bark and galls are identified by the Physicians Desk Reference (PDR), Tova Navarra, B.A., R.N., and Myron A. Lipkowitz R.Ph., M.D. as being astringent and antiphlogistic: Michael Tierra C.A., N.D., labels oak's bark and acorns as antiseptic. Oak has no known health hazards or side effects. Oak's astringent qualities can mostly be attributed to its high content of tannins, which composes fifty percent of oak gall and up to twenty percent of oak bark. Other active ingredients of oak's medicinal parts include gallotannins, allagic tannins, catechin tannins, monomeric and dimeric catechins and leucocyanidins.  **Cinnamon**  (*Cinnamonum Verum)* is an ancient herbal medicine first recorded in the Jewish Torah. It was used in India as a warming remedy since the earliest recorded times, and was first used in Egypt and Europe in 500 BC for colds, flu, and digestive problems. Traditionally, cinnamon is used externally for treating wounds. Penelope Ody, a member of the National Institute of Modern Herbalists in the United Kingdom, claims that the bark and twigs of cinnamon are antiseptic. Her claims are supported by research reported by Andrew Chevallier, in which experiments were conducted that support the hypothesis that extracts of cinnamon bark have antibacterial and anti-fungal actions. Chevallier and the PDR attribute cinnamon with antiseptic, anti-fungal, and insect repellant qualities. Cinnamon's active ingredients, listed by the PDR, include deterpenes, oligomeric proanthocyanidins, and mucilages.  **Garlic** (*Allium Sativum)* has gained a great deal of recent fame due to its apparent health benefits, with over 2.5 thousand studies conducted on it in the past twenty years. However, celebration of garlic as a medical treatment is hardly a new development. Ancient Egyptians used garlic to cure headaches, heart disorders, and intestinal worms; Olympic athletes of the same era took garlic to increase their energy before important events. In the first century AD garlic was prescribed by Dioscorides, the chief Roman army physician, as an anthelmintic agent (intestinal worm killer). Throughout history garlic has been esteemed for its healing powers and used as a treatment for all infections; its greatest large scale use within recent memory was during World War I, when it was used to dress wounds. Researchers hail garlic as antibacterial, antimycotic, lipid-lowering, an immune system booster, an inhibitor of platelet aggregation, and an antibiotic. The main ingredient believed to be the beneficial component of garlic, allicin, is both highly antiseptic and highly antibiotic, according to research reported by Andrew Chevallier. Active compounds include alleins (alkyl cysteina sulfoxides), fructosans (polysaccharides) and saponins.  **Sage** (Salvia Officinalis) is named from the Latin word "salveo," meaning "I heal," and salvus, "to save." It has been used since prehistoric times to promote longevity, as attested by the medieval saying "Why should a man die while sage grows in his garden?" In medieval England sage was laid on graves to temper grief and was relied on as a fortune telling device for single girls. Seventeenth Century British author John Evelyn wrote that the proper intake of sage could make a man immortal. When Britain began trading with China for tea, sage was so valued that the Chinese would trade two cases of tea for one case of dried English sage. The PDR reports that the medicinal portions of sage are its' dried leaves, oil from flowers and stems, and fresh leaves, and the medicinal uses of these portions include antibacterial, fungistatic, virostatic, and astringent properties. Penelope Ody and Andrew Chevallier both name sage as astringent and antiseptic; Chevallier adds carminative, estrogenic, and tonic to the list of sage's medical benefits. Active compounds of sage include caffeic acid derivatives, deterpenes, flavonoids, and triterpenes.   |  |  | | --- | --- | |  | **Lavender** (Lavandula Angustifolia) was popular as a medicine in the late middle ages, and was taken by the Pilgrims as a medicinal herb to North America in 1620. Named from Latin "lavare", meaning "to wash", lavender was used in ancient Arab medicine as an expectorant and antispasmodic and in ancient and medieval Europe as a wound herb and worm remedy. Penelope Ody and Andrew Chevallier both label lavender as antibacterial and antiseptic; in contrast, the PDR declares lavender to be an external rubefacient and Dr. Myron A. Lipkowitz names lavender as useful for the external treatment of insect bites, cuts and bruises. The medicinal parts of lavender plants are listed by the PDR as the fresh flowers, dried flowers, and oil of the flowers. Active compounds include hydroxycorumarins, tannins, and caffeic acid derivatives. |   **Ginger** (Zingiber officinale) has been revered in Asia as a medicinal herb for over two thousand years; in medieval Europe it was thought to be from the Garden of Eden. Chinese and Ayurvedic medicine prescribed a tea made of ginger for colds, mucus congestion, nausea, hangovers, and many other uses. Ginger was introduced to the Americas by Spaniards, where it was used to warm the stomach and dispel chills. The New England Journal of Medicine has noted that ginger is effective against vertigo and motion sickness. A trial in China showed that 70% of patients with bacillary dysentery who were given ginger made a full recovery. Penelope Ody and Andrew Chevallier both give ginger antiseptic; Chevallier and the PDR labels it antiemetic; Chevallier also gives it the qualities of being carminative, a circulatory stimulant, anti-inflammatory. Ginger is generally used as an astringent. Its' active compounds include arylalkane, gingerds, shogaols, gingerdoils, and diarylheptanoids.  ***Bacteria Used in Experiment***  **Bacillus cereus** is a gram positive, facultatively aerobic spore former consisting of large, rod-shaped cells. Bacillus cereus causes two types of food poisoning in humans: diarrhea, which is caused by a large molecular weight protein, and vomiting (emetic), which is believed to be caused by a low molecular weight, heat-stable peptide. Other clinical manifestations of bacillus cereus include bovine mastitis, severe systemic and pyogenic infections, gangrene, septic meningitis, lung abscesses, and infant death. All humans are believed to be susceptible to bacillus cereus, which is generally contacted from meats, milk, vegetables, fish, starchy foods, rice products, and prepared food mixtures.  **Escherichia coli** is a gram negative, rod shaped bacteria of the family Enterobacteriaceae, commonly called E. coli. In humans, Escherichia coli causes watery or bloody diarrhea. Watery diarrhea is caused by the bacteria's attachment to and physical alteration of the integrity of the intestine. Bloody diarrhea is associated with the bacteria's attachment and an acute tissue-destructive process. The bacteria most commonly infects infants and in infants can lead to dehydration, electrolyte imbalance and death, with a 50% mortality rate in third world countries. Escherichia coli most often affects bottle fed infants, probably because the water used to mix with the formula is contaminated with Escherichia coli. An infective dose of Escherichia coli is presumably low for infants, but in adults a 10^6 total dose is required, which explains its rare rate of occurrence in adults. Generally people get Escherichia coli from raw beef and chicken, although any food or water exposed to fecal contamination is suspect.  ***Method of Experimentation***  In this experiment the Kirby-Bauer test was used. In this standardized test, discs of chromatography paper containing a specified amount of antibiotics (or, in this case, antiseptics) are placed on an agar plate already inoculated with a lawn of the microorganism the antiseptics are to be tested against. The antiseptics will create zones of inhibitions as according to their effectiveness as an antibiotic, which can then be measured and correlated to any known minimum inhibitory concentration (MIC). These zones of inhibitions can be used to measure the suseptibility of the microorganism to the antiseptic, dividing the microorganism into one of three categories: susceptible, intermediate, or resistant. There are different ranges of values for the susceptibility of each microorganism to each antibiotic or antiseptic. The sizes of zones may also be effected by the growth medium used or the age of the growth medium, and the humidity.  This experiment has been designed to test the effectiveness of oak, lavender, sage, garlic, cinnamon, and ginger as antiseptics; likewise, it will test the susceptibility of Bacillus cereus and E. coli to these herbs. If a herb has antiseptic properties, then it will show a visible zone of inhibition when tested against these bacteria, and herbs showing such a zone may be effective antiseptics. | | |
|  |  | |