



by Roberta Baxter

Bad breath has haunted people for eons. Ancient people chewed on mint or cloves to freshen their breath. Today, ingredients from mint and cloves are used in our modern mouthwash products. Bad breath is not just a personal problem; it is big business. Americans spend about \$780 million a year on mouthwash. Are we getting our money's worth? Does mouthwash work?

Mouthwash

People use mouthwash for three reasons: to reduce the growth of plaque on their teeth, to fight cavities, or to freshen their breath.

Reduce Plaque

Dental plaque is the gelatinous layer of bacteria that collects naturally on the teeth. However, excessive plaque can cause gingivitis, a disease of the gums that can lead to surgery or teeth extraction. Brushing your teeth and using dental floss are mechanical abrasive actions that can remove plaque.

Mouthwashes claim to reduce plaque by killing the bacteria that form plaque.

An effective mouthwash must be good at killing oral bacteria. Listerine has been on the market for decades. It contains chemicals found in essential oils—liquids extracted from plants. The key ingredient in Listerine was originally extracted from the herb thyme. The compound, called thymol, kills mold and bacteria. To mask the pungent taste of thymol, two other oils are added—

eugenol and eucalyptol.

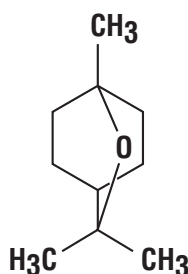
Eugenol has a spicy clove taste (it is

obtained from cloves), and eucalyptol—chief ingredient in the oil of the eucalyptus tree—gives a cooling taste.

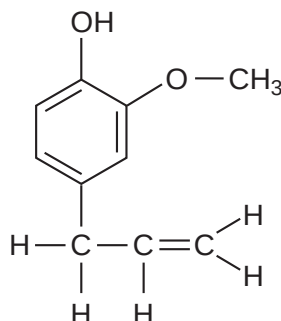
All three of these compounds are insoluble in water but they dissolve readily in ethyl alcohol. So alcohol was added to the recipe to dissolve the essential oils, and because ethyl alcohol also kills bacteria. In combination, Listerine's active ingredients are thought to work by destroying the cell wall of the bacteria and inhibiting some bacterial enzymes.

Because some people do not like the strong, medicinal taste of the original mix-

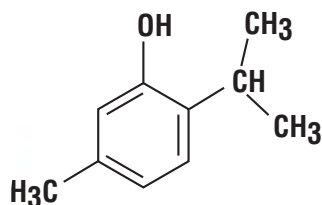
What's In It For You?



Eucalyptol is in oil of eucalyptus



Eugenol is in oil of cloves



Thymol is found in oil of thyme



ture, Cool Mint Listerine was introduced with the same antimicrobial ingredients with mint flavor and a slightly lower alcohol content. Studies have shown a 20–30% reduction in plaque with twice-a-day use of Listerine. The bacterial reduction lasts for at least 30 minutes. Listerine was the first over-the-counter mouthwash approved by the American Dental Association (ADA).

Competing brands rely on other chemical ingredients. Scope and Cepacol contain 0.05% of a chemical called cetylpyridinium chloride in 14–18% alcohol. The cetylpyridinium ion disrupts the bacterial cell wall and binds strongly to tissues in the mouth, mainly because of its positive charge.

However, these molecules are released fairly quickly, so the bacteria-killing effect does not last long, and these mouthwashes show only about a 14% reduction in plaque.

A herbal extract from the bloodroot plant, sanguinarine, is used in the mouthwash Viadent. The extract contains a mixture of compounds that appear to change the bacteria cell wall so that attachment to teeth is reduced. The combination of Viadent toothpaste and mouthwash produce the best results with about 20% plaque reduction.

Fight Cavities

Some mouthwashes, such as Fluoridgard and Act contain cavity-fighting fluoride. In the early 1900s, dentists and scientists

began noticing that children living in certain towns had fewer cavities. After investigation, they determined that these children lived in areas that naturally had more fluoride ions in the drinkingwater. Fluoride strengthens the enamel of the teeth and inhibits the bacteria that metabolize sugars into acids. After much research, some health agencies recommended adding a small amount of fluoride to drinkingwater across the United States, and today, most communities have fluoride in their water. In the 1950s, toothpaste manufacturers also started adding fluoride to their products. The most effective fluoride sources are in drinkingwater, toothpaste, or fluoride treatments applied by a dentist.

Some added protection from cavities can come from mouthwashes containing fluoride, although the concentration of sodium fluoride, NaF, is very low (0.05%). Some studies have shown that cavities could be reduced 35–40% when fluoride mouthwash was used twice a day. However, critics say that these studies were not done correctly with a control group or a long enough time frame.

Many experts believe that fluoride mouthwash is of *some* help to *some* people

When you are shopping for a mouthwash, it is a good idea to look for the American Dental Association Seal of Acceptance. Since the 1930s, the seal has been given to products that have met the requirements of the American Dental Association. Products must be proved safe and effective in rigorous clinical tests, and the advertising claims must be supported by those tests.





if it is part of a daily dental routine; however, most people who drink fluoridated water, use a fluoride toothpaste, and are not prone to cavities do not need a fluoride mouthwash. Ask your dentist what is best for you.

Note: Anyone using fluoride mouthwash should not swallow it; it is not recommended for small children who may not observe this caution.

Sweeten Bad Breath

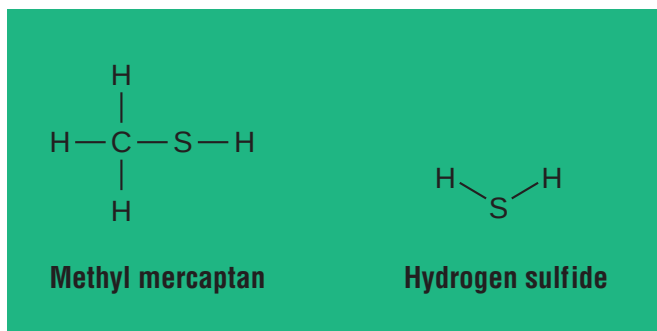
There are two causes of bad breath: eating smelly foods and letting protein decay in your mouth. As anyone who eats pizza knows, onions and garlic are notorious for causing bad breath; the aggressive odor is caused by the same compounds that give onions and garlic their spicy taste. But any food can cause bad breath if it sits around your mouth too long. The normal bacteria in the mouth attack any food debris and break it down, and then the mouth bacteria themselves decay. The result—bad breath. Saliva washes the teeth and reduces the odor to some extent. The dreaded “morning breath” is stronger because while you sleep the production of saliva is decreased. Bad breath

can be caused by decaying teeth, so check with your dentist if you seem to have persistent bad breath.

Most of the mouthwashes that reduce plaque and fight cavities will also freshen your breath, because the same bacteria-killing effect that works against plaque and cavities, also reduces the bacteria that release those smelly compounds.

Some mouthwash products claim to freshen your breath but make no claims about preventing plaque or cavities. These simply cover up the bad breath smell with pleasant aromas. Don't expect your freshened breath to last forever. The most effective mouthwashes improve your breath for one to three hours, and only if you brush your teeth thoroughly before using the mouthwash.

How do you know which mouthwash is right for you? Ask your dentist, and read the labels.



Bad breath consists of several odors mixed together. Some of the worst odors are caused by methyl mercaptan and hydrogen sulfide, which are released when food and bacteria decompose. Hydrogen sulfide is the compound that gives rotten eggs such a foul smell.



Roberta Baxter is a freelance science writer who lives in Colorado Springs, Colorado. Her article; “Frozen Gas Discovered in World’s Coldest Test Tube,” appeared in the October 1996 issue of *Chem Matters*.

FOR FURTHER INFORMATION

“Fluoridated mouthwash.” *Consumer Reports* 1993, 58(11), 743.
Modell, Jack G.; Taylor, Jasmine P.; Lee, Jeanette Y. “Breath alcohol values following mouthwash use.” *JAMA, The Journal of the American Medical Association* 1993, 270 (24), 2955.