

Chew on This

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The concept of chewing on something for no reason other than enjoyment has been around for a long time. The Egyptians and Mayans first chewed on tree resins. Since this time, gum chewing has come a long way. The first commercial gum was patented by a dentist in 1869 (Imfeld, 1999). Currently in America, gum chewing is a big part of our culture, totaling five billion dollars worth of sales per year. Even though large amounts of gum are consumed in the United States, there seems to be a negative stigma associated with gum chewing. Numerous high school students have to spit out their still flavorful gum when they give presentations. We tend to picture the typical dumb teenaged girl as portrayed in “chick flicks,” twirling her hair as she smacks on a piece of gum. A great example of this is Violet Beauregarde from Mel Stuart’s *Willy Wonka and the Chocolate Factory* (1971): a young girl who chomps on her gum and blows bubbles and whose gum chewing habits are the reason she loses the challenge to get the factory. Many parents don’t let their kids chew gum because “it makes them look like a cow chewing on their cud.” A little saying from gumisgross.com demonstrates the negative stigma around gum chewing: “The gum chewing girl and the cud chewing cow are so alike, yet differ somehow. Ah yes, I see it now! It's the intelligent look on the face of the cow!” A cartoonist also shows the similarities between a gum chewer and a cow (Figure 1). People have even gone so far as to make up rumors of gum remaining in your stomach for up to

seven years. With so many negative attitudes towards gum chewers, is it possible that gum could actually be good for us?

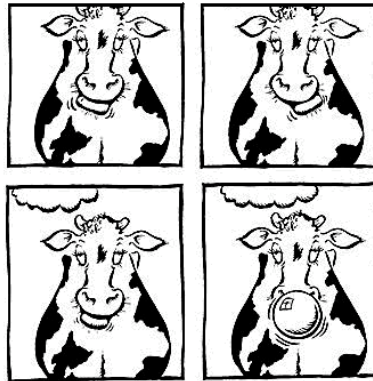


Figure 1: Cartoon by Berkin Philip
from CartoonStock.com

Background

Chewing gum has four main components: gum base, aromatic agents, flavoring, and sweetening (Imfeld, 1999). There are two major types of chewing gum, sugared and sugar-free. The biggest difference between these two is the sweetener. While all of the ingredients are important, it's the sweetener component that has the greatest potential benefits. Sugared gum primarily uses glucose, a natural sugar, as the sweetener, whereas sugarless gum uses sugar substitutes called polyols, which are sugar alcohols. The two most common polyols used are xylitol and sorbitol, which are just different variations of a polyol that come from different fruit sources. The structures of these sweeteners are only slightly different from one another (figure 2); however, these minor differences cause glucose and the respective polyols to each have its own set of benefits as well as drawbacks.

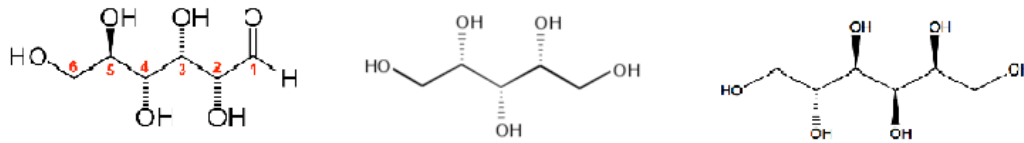


Figure 2:

A) Glucose Structure

B) Xylitol Structure

C) Sorbitol Structure

There are also many forms of gum that include supplements that benefit certain aspects of health. Gum has been specially manufactured for purposes such as whitening teeth or delivering forms of medication. Nicotine gum is another common use of gum, to help people stop smoking. While these other forms of gum have a lot to offer, this paper will consider only the average commercial gum, both sugared and sugar-free.

Gum and Memory

One potential benefit of chewing gum is its assistance with improving memory. Many studies have been done on how chewing both sugar-free and sugared gum potentially influences memory. Studies on sugar-free gum have been inconclusive. One study suggested that “chewing gum of itself is not a sufficient condition to provoke context-dependent learning” (Miles & Johnson, 2007). Other studies, however, found that chewing sugar-free gum improved both immediate and delayed word recall, as well as spatial and numeric working memory (Wilkinson, Scholey, & Wesnes, 2002). This means that people chewing gum demonstrated a greater ability to remember words, remember where things were placed relative to each other, and remember number sequences. This is interesting because gum could help people who work with numbers on the job, such as accountants or people in the business world, and also, it could help improve vocabulary for people in all professions. One possible explanation for improved

memory is that chewing gum increases cerebral blood flow, or blood flow to the head (Hasegawa, Ono, Hori, & Nokubi, 2007). Any organ functions better when it receives a greater amount of blood flow, and thus a greater amount of oxygen flow. Simple jaw movement could be the reason the study obtained the results that it did; thus the effects could be independent of the actual gum itself.

Slightly more conclusive evidence in regard to memory enhancement can be found in studies of sugared gum. Recall that sugared gum's main sweetener is glucose. Many studies have been done which suggest that glucose enhances memory. Glucose affects the hippocampus, which is responsible for making new memories, primarily episodic ones, including memory of events and times as well as places (Stephens & Tunney, 2008). Tests done by Norman White showed that glucose improved memory at two ideal doses, but seemed to have no effect in between those specific quantities of glucose (1998). Because this suggests that glucose is effective only at certain doses and there is no indication whether or not the amount of glucose delivered from sugared gum is equivalent to these particular values, it is unclear whether chewing sugared gum will necessarily enhance memory. Another important test performed by White looked at the difference between healthy individuals and those with memory impairments. He found that "the effects in normal young people are relatively small and can be difficult to demonstrate, whereas somewhat larger and more reliable effects are observed in older people, or people with specifically impaired memory functions" (White, 1998). Given all of this evidence, it seems that chewing gum, either sugarless or sugared, may improve aspects of memory, but this should not be taken as conclusive.

Gum and Gastric Health

Many people in our society experience some type of gastro-esophageal symptoms, including heartburn, epigastric pain, and regurgitation. This poses a problem to health because acid from the stomach moves up the esophagus into the mouth, which can cause damage to the esophagus as well as dental erosion. People have looked at ways to help reduce the negative effects of such things, including the use of chewing gum. A study done in London showed that chewing gum for thirty minutes after a meal was in fact successful at reducing acidic postprandial esophageal reflux (Moazzez, Bartlett, & Anggiansah, 2005). Chewing gum, both sugar-free and sugared, is known to be a salivary stimulant, which makes it successful in reducing the effects of reflux. Gum is chewed, producing more saliva, which is then swallowed. The swallowed saliva has the ability to clear the esophagus, which neutralizes any of the potentially harmful acid that is remaining there (Moazzez, Bartlett, & Anggiansah, 2005). Evidence regarding the role of gum in decreasing the effects of gastro-esophageal reflux seems to be noncontroversial and conclusive. Chewing gum could often be an easy and simple alternative to expensive acid-reflux medications.

While gum can benefit one aspect of gastro health, the polyols used in sugarless gum in rare cases have been known to cause extreme weight loss and diarrhea. When consumed in large quantities the polyols act as a laxative. As ABC News reported, one woman went to her doctor complaining of abdominal pains and a weight loss of over twenty-five pounds (Childs, 2008). The doctors discovered that her chewing of an average of 16 pieces of sugar-free gum a day was to blame. This demonstrates how the

polyols used as a sugar substitute may have their benefits, but when consumed in ridiculously large amounts they can be bad for your health.

There are no known reports of people intentionally consuming large amounts of gum to lose weight, but as has been demonstrated in the past, people will go to extremes in the name of dieting. If more people found out about the laxative effects of sugarless gum, it is possible that chewing large amounts of sugarless gum would become one of the many ways people use to try to lose weight in an unhealthy manner.

Gum and Dental Health

Arguably the greatest benefit of chewing gum comes in its support of dental health. Both xylitol and sorbitol have been proven to prevent caries, which is tooth decay that leads to cavities. These polyols are effective at preventing caries for two reasons. The first is stimulation of saliva flow. As with gastric acid, the polyols neutralize pH; however, in this case, they neutralize the pH of the plaque that follows ingestion and leads to cavity development. The second way these sugar substitutes decrease the number of caries is essentially by starving the microorganisms that cause them. Typically streptococcus, the primary cavity-causing bacterium, feeds on glucose, but when this is replaced by one of the polyols, the bacteria have nothing to feed on and so they die (Burt, 2006). It is important to recognize here that sugared gum does not have these same effects, because it has glucose and thus actually provides food to the microorganisms. Not only is sugared gum not effective in decreasing the number of caries, but because it feeds the bacteria, it is in fact a cariogenic (caries-causing) substance (Burt, 2006).

Gum and Jaw Health

While sugar-free gum has been shown to help prevent caries, it could have negative effects on your jaw. This is true for sugared gum as well. Temporomandibular joint disturbance, or TMJ, is a condition that causes soreness and clicking in the jaw. In more extreme cases people can experience excruciating ear pain, headaches, or inability to completely open their mouth. It has been suggested that for people who are predisposed to this condition, gum chewing can induce TMJ because it puts strain on the jaw (Dr. Stang, personal communication, 2008). Evidence regarding this topic is not very conclusive, however, because only a few studies have been done and they show conflicting results. One study showed that for people with TMJ, gum chewing was associated with a higher incidence of pain (Store Kro Group, 2001), but other studies have shown it has no effect (Imfeld, 1999). Based on these results there is still a lot of room for further studies. Potential studies could also test to see whether gum can have a positive impact on the jaw in the way of physical therapy for people recovering from a jaw injury.

Sugared, Sugar-free, or Neither?

Next time you're chewing on a piece of gum and your grandmother gives you a lecture about how you're sending a negative message about your ethos, maybe you should have a talk with her about all the good things it's doing for you. Who cares if you look like an unintelligent cow if it's in the name of health? But are all these benefits really worth sacrificing your image? Chewing gum seems as if it has a lot of potential to help, but because much of the evidence is not conclusive I wouldn't recommend

changing your lifestyle to include gum in your daily routine, especially since the majority of the benefits of gum are to the person who isn't the average healthy individual. For example, if you are experiencing memory loss, it might be beneficial to chew sugar-free gum. Along these same lines, if you are having extreme gastro-esophageal reflux problems, gum may be a cheap way to help, but most people will not gain any benefit from this. Also, concerning gum chewing for dental hygiene, which seems to have the most potential benefit, it has been said that gum should not be considered a replacement for basic practices such as brushing your teeth and flossing (Imfeld, 1999).

Sugared gum may have the potential to improve your memory, or help lessen the damage of reflux, but it has been shown to cause caries, so it is not without drawbacks. Sugar-free gum, on the other hand, has not been proven to have any negative consequences besides acting as a laxative, which occurs only when it is consumed in large amounts, but it will likely reduce the number of caries developed and, just as with sugared gum, help reduce problems associated with reflux. Based on all of the research it seems that overall, sugarless gum is the better choice; however, there are still many uncertainties and thus many opportunities to do more studies to obtain more valuable results.

One test that would be particularly interesting involves the effects of gum on memory and whether different age groups were affected in different ways. Many schools prohibit gum chewing because kids put their gum in places other than the trash, creating "gumffiti" underneath the tables. Is it possible, though, that allowing these kids to chew gum might improve their learning? Another interesting study would involve the laxative aspects of the polyols. If gum were consumed in more than normal amounts, but still less

than the amount that caused the extreme cases of severe weight loss, could it be used to help patients with constipation? There are still many areas that can be researched, but since the current evidence on the benefits of chewing even sugar-free gum is not particularly compelling, there is no need for anybody to run out to the store and buy a pack of gum in the name of health.

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