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What causes cavities? by Mel Rosenberg - TedEd



<https://www.youtube.com/watch?v=zGoBFU1q4g0>

When a team of archaeologists recently came across some 15,000 year-old human remains, they made an interesting discovery. The teeth of those ancient humans were riddled with holes. Their cavities were caused by the same thing that still plagues us today: specific tiny microbes that live in our mouths.

These microbes are with us soon after birth. We typically pick them up as babies from our mothers' mouths, and as our teeth erupt, they naturally begin to accumulate communities of bacteria. Depending on what we eat, and specifically how much sugar we consume, certain microbes can overpopulate and cause cavities. Diets high in sugary foods cause an explosion of bacteria called *mutans streptococci* in our mouths. Like humans, these microorganisms love sugar, using it as a molecular building block and energy source. As they consume it, the bacteria generate byproducts in the form of acids, such as lactic acid. *Mutans streptococci* are resistant to this acid, but unfortunately, our teeth aren't.

While each human tooth is coated in a hardy, protective layer of enamel, it's no match for acid. That degrades the armor over time, leaching away its calcium minerals. Gradually, acid wears down a pathway for bacteria into the tooth's secondary layer called the dentin. Since blood vessels and nerves in our teeth are enclosed deep within, at this stage, the expanding cavity doesn't hurt. But if the damage extends beyond the dentin, the bacterial invasion progresses, causing excruciating pain as the nerves become exposed. Without treatment, the whole tooth may become infected and require removal, all due to those sugar-loving bacteria. The more sugar our food contains, the more our teeth are put at risk.

Those cavemen would hardly have indulged in sugary treats, however, so what caused their cavities? In meat-heavy diets, there would have been a low-risk of cavities developing because lean meat contains very little sugar, but that's not all our early human ancestors ate. Cavemen would also have consumed root vegetables, nuts, and grains, all of which contain carbohydrates. When exposed to enzymes in the saliva, carbohydrates get broken down into simpler sugars, which can become the fodder for those ravenous mouth bacteria. So while ancient humans did eat less sugar compared to us, their teeth were still exposed to

sugars. That doesn't mean they were unable to treat their cavities, though. Archaeological remains show that about 14,000 years ago, humans were already using sharpened flint to remove bits of rotten teeth. Ancient humans even made rudimentary drills to smooth out the rough holes left behind and beeswax to plug cavities, like modern-day fillings.

Today, we have much more sophisticated techniques and tools, which is fortunate because we also need to contend with our more damaging, sugar-guzzling ways. After the Industrial Revolution, the human incidence of cavities surged because suddenly we had technological advances that made refined sugar cheaper and accessible. Today, an incredible 92% of American adults have had cavities in their teeth. Some people are more susceptible to cavities due to genes that may cause certain weaknesses, like softer enamel, but for most, high sugar consumption is to blame. However, we have developed other ways of minimizing cavities besides reducing our intake of sugar and starch. In most toothpastes and many water supplies, we use tiny amounts of fluoride. That strengthens teeth and encourages the growth of enamel crystals that build up a tooth's defenses against acid. When cavities do develop, we use tooth fillings to fill and close off the infected area, preventing them from getting worse.

The best way to avoid a cavity is still cutting down on sugar intake and practicing good oral hygiene to get rid of the bacteria and their food sources. That includes regular tooth brushing, flossing, and avoiding sugary, starchy, and sticky foods that cling to your teeth between meals. Gradually, the population of sugar-loving microbes in your mouth will decline. Unlike the cavemen of yesteryear, today we have the knowledge required to avert a cavity calamity. We just need to use it.