

Tooth decay

Tooth decay (dental caries) is the destruction of tooth tissue by the action of *cariogenic bacteria*. These are germs that cause dental caries.

Almost as soon as teeth erupt through the gums, germs from the mouth will attach to them and multiply. If left undisturbed they will soon form a sticky white layer of bacteria, called dental plaque, on the tooth surface.

Diet and decay

The bacteria in dental plaque thrive on sugars in our diet. Whenever we eat or drink sugary things, the bacteria consume the sugars and release acid as a waste product which weakens enamel by dissolving mineral from its surface. Over time (usually several years), if left unchecked, the acid will dissolve a hole through the enamel and allow bacteria to enter the softer dentine layer, resulting in tooth decay (dental caries). The body's main natural defence against early tooth decay is **SALIVA**. It contains compounds which neutralise the bacterial acids and also has minerals which can repair and strengthen enamel.

Tooth decay will develop more frequently in areas where plaque is left undisturbed. These tend to include the rough biting surfaces of the back teeth and the surfaces in between your teeth because they are the hardest ones to clean effectively. Appropriate tooth brushing techniques and interdental cleaning will significantly lower the risk of dental decay at these sites.

Tooth surfaces which are repeatedly exposed to sugars are also at a higher risk for developing decay. An example of this is 'baby bottle caries' that occurs when babies and toddlers are fed sugar-containing drinks such as formula and fruit juice, from a bottle during the day and at night for several years. The bottle teat concentrates the sugary liquids around the front teeth which can develop painful and unsightly cavities. To prevent this condition from developing or getting worse, children should be given only milk and water to drink. They should be encouraged to use a free-flow cup as early as possible, ideally by the age of 1 year. Their teeth should be brushed twice daily as soon as they erupt and they should only be given water to drink at night after tooth brushing.

Tooth decay (dental caries) has two stages:

Stage one

This is a slow, reversible process that usually takes several years to complete. However, it can be faster in baby or milk teeth because they have thinner enamel. There is a back and forth battle between the acid from dental plaque and our own saliva. Within minutes of eating a sugary snack the germs (bacteria) in plaque will break the sugars down and excrete acid directly on to the tooth surface. The acid de-mineralises, or dissolves, mineral from the enamel layer for approximately 15 minutes before the saliva is able to neutralise the acid and begin repairing, or re-mineralising, the enamel surface.

This process of weakening and repairing enamel can continue indefinitely without ever progressing to the second stage. Some toothpastes and mouth washes contain minerals, such as fluoride, that can strengthen enamel and make it more resistant to plaque acids. Higher concentrations of fluoride may also be applied by your dentist, in the form of a varnish to vulnerable areas of your teeth.

Stage two

Caries will progress to the second stage when more enamel de-mineralisation is taking place than re-mineralisation – that is, a net loss of enamel minerals. If this is the case then the enamel will eventually weaken and crumble enough for bacteria and toxins to pass through and invade the dentine. Dentine is softer than enamel and is composed of tiny tubes, so caries will spread at a faster rate and in a wider arc through dentine than it could through enamel. When a large area of dentine has been de-mineralised and softened, the enamel layer above may collapse inwards, or cavitate, to form a tooth cavity.

When the bacteria invade the dentine, the tooth has a limited ability to protect the vulnerable pulp by producing a new layer of dentine. This is why some teeth can recover from very large dental cavities if the caries is removed and a filling is placed promptly. This healing potential within the tooth shows why it is so important to attend for dental treatment when you suspect you may have a dental problem rather than waiting for weeks or months to see if the problem goes away.

How common is it?

Tooth decay (dental caries) is the most common oral disease in the world. Although it is a mostly preventable disease, almost nine out of ten adults and more than five out of ten children under the age of 16 years will have some experience of caries in the form of a filling, extraction or toothache. This is usually due to the high amount of simple sugars, or refined carbohydrates, in the human diet coupled with poor oral hygiene.

Although the consequences of tooth decay are rarely life-threatening, the effect it can have on normal life can be profound. Just ask anyone who has experienced toothache or has too few remaining teeth to chew properly.

What are the symptoms of tooth decay?

Early tooth decay (dental caries) is usually symptom-free. It is only when the caries has progressed deep enough into the dentine to cause one of the following scenarios that most people become aware that they have a dental problem:

1. Caries spreads through the dentine, softening it significantly. This leads to the enamel fracturing and collapsing to form a cavity, usually after biting on to something hard. Until this happens, there may be toothache or no symptoms at all. The edges of the cavity can be quite sharp and are often the main complaint when people attend for dental treatment
2. The pulp becomes inflamed and irritated by the acid and toxins being released by the bacteria in the pulp. This is called pulpitis and causes the tooth to feel sensitive to hot or cold or sweet food and drinks. When the pulp has become very inflamed the tooth may become tender to bite on to - this is called periapical [periodontitis](#).

In both these scenarios non-invasive treatment options are no longer suitable and a filling is usually required.

This is why regular dental check-ups are so important. The dental team is trained to identify early signs of possible tooth decay, such as chalky whitish or grey shadowy areas on the biting surfaces, or between the teeth, then recommend appropriate measures.

Advanced dental decay will usually cause the pulp to become severely inflamed and die. This is usually after a period of painful pulpitis.

Occasionally it can happen in teeth that have felt little or no pain at all.

When the bacteria have infected the pulp space, they multiply and spread out into the bone at the end of the tooth root. This forms a 'periapical abscess' which makes the tooth extremely painful to bite on to.

Paradoxically, the pain improve when enough bone has been destroyed to allow the trapped infection to drain away under the gum. The treatment for a periapical abscess is either [root canal](#) treatment or a tooth extraction.

How is tooth decay diagnosed?

Your saliva plays a vital role in protecting your teeth from tooth decay (dental caries). Certain medical conditions and types of medication can affect the volume and quality of your saliva. That is why it is important that you keep your dentist up to date regarding any changes to your medical history. If you feel that your mouth has become drier than usual you should discuss this with your dentist. They will assess the function of your salivary glands or may refer you to a specialist.

During a dental inspection your dentist will use bright lights, mirrors, jets of air and magnifying equipment to inspect all of your tooth surfaces for signs of tooth decay. Close attention will be paid to any high-risk sites such as overlapping teeth or teeth erupting at an angle. Your dentist will also examine your lips, cheeks, tongue and the other soft tissues of your mouth. This is to check for signs of other conditions such as oral cancers or infections.

What about check-ups?

The best scenario for treating tooth decay (dental caries) is to identify the lesion as early as possible to minimise the need for large fillings. Enamel lesions can remain intact indefinitely and may never require a filling as long as they are kept clean and strengthened with fluoride from toothpaste, mouthwash or dental varnish on a routine basis

The interval between your check-ups will depend on your level of dental risk and your dental history. If you have very few fillings and practise a good level of [oral hygiene](#) you might be placed on a 12-month or 18-month recall list. If you have many fillings and keep developing new cavities every year, you may need to be seen every six months until your caries rate stabilises.

What are dental X-rays?

If needed, your dentist may recommend an X-ray. This allows tiny areas of enamel weakening between the teeth to be identified early. This in turn means they can be treated appropriately to stop them from developing into dental cavities. Dental X-rays will usually be repeated at regular intervals (often two years apart) to monitor the progress of previously identified small lesions and to check for new areas of decay.

How is tooth decay treated?

This usually depends on the extent of the tooth decay (dental caries) and the condition of the pulp - is it alive, inflamed or dead? The aim of treatment is to remove existing decay, restore damaged teeth and remove factors that trap plaque and risk further decay.

When tooth decay has entered the dentine it is necessary to remove the infected dentine and place a filling. The selection of filling material usually depends on the location of the cavity. Everybody prefers white fillings but in a few situations they might not be practical or possible and a silver filling may be more appropriate. Your dentist should discuss the options with you.

If the caries has affected the pulp, it may be necessary to protect it with special dressings or to remove an infected or dying pulp by performing root canal treatment.

If the caries are too extensive and not enough healthy tooth remains, an extraction may be necessary

How do you prevent tooth decay?

Considering the avoidable nature of tooth decay (dental caries), this is a classic example of 'Prevention is better than cure'.

As well as providing advice about diet, dental hygiene instruments and improved cleaning techniques. Your dental team may also suggest the use of fluoride varnishes and mouthwashes to strengthen areas of weakened enamel.

Attend regular dental inspections - usually every 6 or 12 months as recommended by your dentist. Make an appointment to see your dentist if you suspect a tooth has broken or if you feel symptoms of sensitivity or toothache that lasts for more than one or two days.

You can find full details of how to prevent dental caries in our leaflet on [oral hygiene](#).

(Sep 2017) Dr Hayley Willacy recent read a large, UK-based trial looking at two interventions to prevent tooth decay: see below. It supports NICE recommendations to apply fluoride varnish to children's teeth in a school-based dental programme in areas of high need with children at risk. The options were a fluoride varnish - applied six times every six months at school, or a protective polymer coating, applied once and replaced if needed. Children's permanent back teeth are particularly vulnerable to decay when they first come through. The pitted biting surface can make these teeth difficult to keep clean to prevent decay.

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