Dental Caries:

-Dental caries is an infectious microbiologic disease of the teeth that results in localized dissolution and destruction of the calcified tissues.

-Dental caries is demineralization 🡪 “ if we placed a tooth in an acid it will get demineralized and that’s what caries is but here without the pathogenic bacteria of course “.

-the carbohydrates that are able to be fermented by bacteria are the ones that cause caries.

-There are four main elements required for caries formation:

1. A tooth surface ([enamel](http://en.wikipedia.org/wiki/Tooth_enamel) or [dentin](http://en.wikipedia.org/wiki/Dentin))
2. Cariogenic (or potentially caries causing) [bacteria](http://en.wikipedia.org/wiki/Bacteria) 🡪 specific

 Bacteria cause caries.

1. [carbohydrates](http://en.wikipedia.org/wiki/Carbohydrate) ( [sucrose](http://en.wikipedia.org/wiki/Sucrose)) 🡪 sucrose has a double bond , when

Bacteria attacks it , it gets divided into fructose and glucose that

 “single bond “ .

Chocolates and sweets can cause caries more than bread because

bread is formed by starch and it needs time to reach sucrose , But

 sucrose exists in its pure form in chocolates and sweets .

the carbohydrates that are able to be fermented by bacteria are the

ones that cause caries .

1. Time
* If the PH was higher than 5.5, no acidity, remineralization can happen . When we eat something sweet, the PH will drop below 5.5 and here bacteria starts working and once it reaches 3-4 another bacteria join us here.
* We can find people with some white lines on their teeth 🡪 that’s how demineralization looks at the beginning.
* Dental caries initially is a reversible disease, until we reach threshold for clinical detection “we see it by our naked eyes “ , we can keep saying its reversible as long as the surface is intact and we don’t see shadows of discoloration , it’s possible to be remineralized again .
* If caries didn’t reach amilodentino junction, it’s still reversible.
* Saliva contains high concentrations of calcium and phosphate ions in solution that serve as a supply of raw material for the remineralization process. Also sometimes when we use fluoride to clean our teeth after the demineralization started to happen, this fluoride might be good to form crystals again and block the surface of the tooth again but here we can see shadows of blue or black color inside because the caries already have reached the dentine.
* Acid attack on tooth surfaces continually occurs throughout an individual's life.
* Below the critical pH (5.5), the tooth minerals act as a buffer and lose calcium and phosphate ions into the plaque; which means that 5.5 is the critical point of dental caries, we have dental plaque on the tooth, when we reach PH 5.5 demineralization happens here, calcium and phosphate get out of the tooth but still in the dental plaque so they work as buffers here but if the PH drops below 5.5 they can’t work as buffers anymore, and bacteria starts causing caries.
* This buffering capacity maintains the local pH at approximately 5.0, which is responsible for the characteristic histologic form of carious lesions. The surface remains intact while the subsurface mineral is lost. This initial carious lesion **limited to the enamel** is called **incipient caries** and is characterized by a virtually intact surface, but a **porous** subsurface.
* At lower pH values, such as 3.0 or 4.0, the surface of enamel is etched and roughened.
* Carious lesions occur under a mass of bacteria **“Dental Plaque”** capable of producing a sufficiently acidic environment to demineralize tooth structure.
* The plaque bacteria metabolize refined carbohydrates for energy and produce organic acids as a by-product 🡪 causes demineralization of crystals.
* Carious lesions progress as a series of **exacerbations and remissions** as the pH at the tooth surface varies with the changes in plaque metabolism.
* **The main cause of dental caries is a bacteria called *Streptococcus mutans* because it’s the only one that can adhere to the dental plaque , after that the rest of the bacteria “** *lactobacilli “* **follow it and by a team work they lead to caries .**
* One group of bacteria, which consists of eight ***Streptococcus mutans (SM)*** serotypes, has been associated with caries. The serotypes have been labeled *a* through *h.*
* All S. *mutans* serotypes have been demonstrated to have a significant potential to cause caries.
* *SM* and *lactobacilli* can produce great amounts of acids (acidogenic), tolerant of acidic environments (aciduric), vigorously stimulated by sucrose, and appear to be the primary organisms associated with caries in humankind.
* **MS are most strongly associated with the onset of caries while lactobacilli are associated with active progression of cavitated lesions.**
* There are 3 terms that we should be familiar with :
1. Organisms that cause caries are termed **cariogenic.**
2. **Acidogenic** : produces acid 🡪 SM ..
3. **Acidouric** : lives in acidic medium 🡪 lactobacilli ..

-The enzyme **glucosyltransferase** may be crucial in the adherence of MS to the pellicle when sucrose is present. “That’s why the MS is the only one which can adhere to the dental plaque because of the presence of this enzyme in it “.

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| Etiology | MS infection |
| Symptoms | Demineralization lesions in teeth |
| Treatment (symptomatic) | Restoration of cavitated lesions |
| Treatment (therapeutic) | Eliminate MS infection “ decrease it by oralHygiene habits “  |
| Post-treatment assessment (symptomatic) | Examine teeth for new lesions |
| Post-treatment assessment (therapeutic) | Bacteriologic testing for MS |

* **Caries is modified by saliva :**

High flow-rate of saliva is a very effective buffer. The balance between demineralization and remineralization can therefore be altered substantially by the rate of salivary flow.

* **Caries is modified by fluoride;** the mineral of enamel, cementum and dentin is a highly-substituted calcium phosphate salt called apatite. The apatite of newly-formed teeth is rich in carbonate, has relatively little fluoride and is relatively soluble. Cycles of partial demineralization and then remineralization in a fluoride-rich environment creates apatite which has less carbonate, more fluoride and is less soluble.

“ calcium phosphate apatite has carbonate that’s easy gets demineralized , toothpastes have fluoride , so when the patient brush his teeth , this fluoride will replace the carbonate and it becomes much more resistant to acid attack and it protects the tooth more as a result . “

* Fluoride-rich, low carbonate apatite can be up to ten times less soluble than apatite low in fluoride and high in carbonate. Topical fluoride also inhibits acid production by plaque bacteria.
* Fluoride in food, drinks, dentifrices, oral rinses and gels, and fluoride in filling materials can therefore all reduce the solubility of teeth, helping to reduce caries risk.
* **Pit-and-fissure caries :**

Pit-and-fissure caries has the **highest prevalence of all dental caries**; the deep infolding of enamel makes [oral hygiene](http://en.wikipedia.org/wiki/Oral_hygiene) along these surfaces difficult, allowing dental caries to be common in these areas.

The pits and fissures provide excellent mechanical shelter for organisms and harbor a community dominated by **S. sanguis** (especially in newly erupted teeth) and other streptococci.

* If you find the rate of S.sanguis higher than normal , then expect caries after 6 to 24 months later ; The appearance of MS in pits and fissures is usually followed by caries 🡪 “*Sealing the pits and fissures just after tooth eruption may be the single most important event in providing their resistance to caries.* “
* In Enamel the appearance of the caries is cone shaped ,

While in the dentine is upside down cone shaped “called

**Base to Base** “ 🡪 in pits and fissure caries.

In Enamel the base is directed toward amelodentinal

Junction, and in the dentine toward the amelodentinal

Junction also “remember its base to base so the base

Is going to be directed to the same direction “



* **Hidden caries** ; a dentinal caries lesion near the occlusal

surface of the tooth, seen in x-ray photograph, whereas in visual

 examination the occlusal enamel is seen intact or only minimally

 perforated. The proposed [patho-physiology](http://en.wikipedia.org/w/index.php?title=Patho-physiology&action=edit&redlink=1) of this phenomenon

 is based on reinforcement and re-mineralization of the outer

 Enamel layer by topical [fluoride](http://en.wikipedia.org/wiki/Fluoride).

* **Smooth enamel caries ;** The proximal enamel surfaces immediately gingival of the contact area are the **second most susceptible areas to caries**. These areas are protected physically and are relatively free from the effects of mastication, tongue movement, and salivary flow 🡪 “nothing to clean the area, dental floss should be used to protect our teeth from this type of caries. “

-Proximal caries, also called interproximal caries.

-We can’t detect this type of caries by the probe, we should use X-rays .