

# Protecting All Children's Teeth

**Caries**

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



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# Introduction



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Caries is an infectious transmissible disease resulting from tooth adherent bacteria that metabolize sugars to produce acid which ultimately demineralize tooth structure and, if left untreated, can progress to a cavity.

Dental caries is the most common chronic disease of childhood and disproportionately affects poor and minority populations.

Early Childhood Caries, or ECC, is the presence of 1 or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of 6.

# Learner Objectives



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Upon completion of this presentation, participants will be able to:

- Define caries and Early Childhood Caries (ECC).
- Name the primary bacteria involved in the caries process.
- Discuss the contribution of carbohydrate metabolism in caries development.
- State the important protective benefits of saliva.
- List risk factors and describe the oral manifestations of ECC.
- Describe the 5 stages of ECC and identify early lesions on physical exam.
- Discuss the impact of ECC on overall health and well-being.
- Recall the 5 major methods of preventing ECC.

# Etiology and Pathophysiology

There are 3 requirements for the formation of dental caries:

1. Cariogenic bacteria
2. Sugar
3. Teeth

Because dental caries has a microbial etiology, caries cannot form in the absence of cariogenic bacteria, regardless of sugar intake.



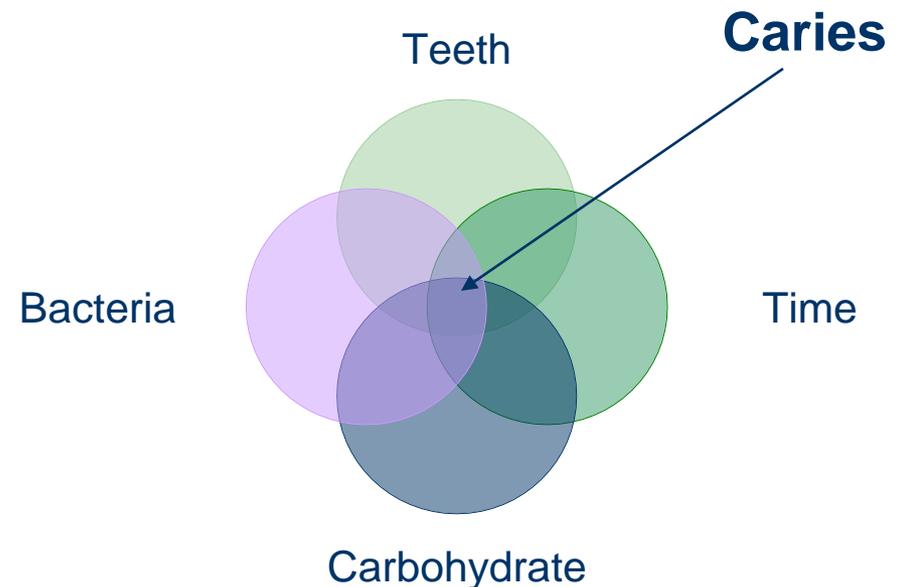
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# Etiology and Pathophysiology

Bacteria adhere to the tooth surface in a biofilm called dental plaque.

When carbohydrates are consumed, they are metabolized by bacteria and produce acid as a byproduct.

The acid causes demineralization of the tooth enamel over time.



created by AAP Oral Health Staff

# Etiology and Pathophysiology, continued

The following factors contribute to demineralization:

- High cariogenic bacterial load
- Frequent feedings
- Poor oral hygiene
- Decreased saliva production

# Etiology and Pathophysiology, continued

These factors aid in the remineralization process:

- Saliva
- Good oral hygiene
- A non-cariogenic diet

However, it is possible to reverse the demineralization process before cavitation occurs.



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# Bacteria

The primary bacterial species involved in the pathogenesis of caries is *Streptococcus mutans*, but many other bacteria have also been implicated, including *S. sobrinus*, *Actinomyces* sp, and *Lactobacillus* sp.

High levels of cariogenic bacteria are indicative of active caries process and are associated with increased risk of new caries development



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## Bacteria, continued

Plaque is composed of salivary proteins that adhere to teeth, as well as bacteria and their byproducts.

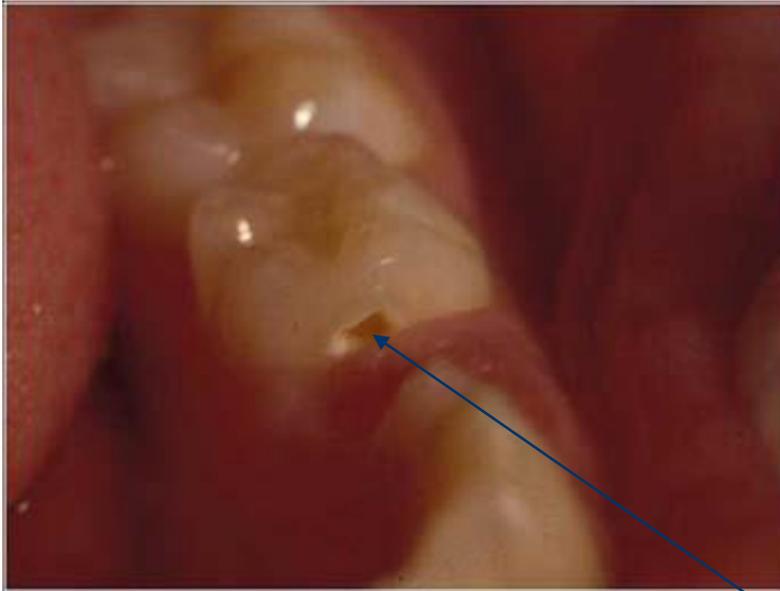
Plaque harbors the bacteria that initiate the demineralization process.

Adequate plaque control can reduce the likelihood of developing dental caries.



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# S Mutans



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*S. mutans* is concentrated in the pits and fissures of teeth, so the grooved surfaces of the molars are the most common site for caries lesions.

Cavity

## S. Mutans, continued

The virulence of *S. mutans* varies by strain. The type of *S. mutans* cannot be modified, but the amount of bacteria can be altered.

These methods can be used to decrease bacteria and minimize caries:

- Brushing with fluoride toothpaste
- Professional dental cleanings
- Exposure to topical fluoride
- Chlorhexidine mouthrinses and *Xylitol* use
- Flossing



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## S Mutans, continued

S mutans is transmitted from the primary caregiver to infant by saliva.

Transmission rates increase when parents:

- Share utensils or toothbrushes.
- Taste food or drink before serving it.
- “Clean” a dropped pacifier with saliva.
- Allow a child to place fingers into an adult's mouth.



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# Sugar



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The metabolism of carbohydrates by oral bacteria creates acid that demineralizes enamel.

The risk of demineralization and caries development is directly related to the frequency with which the teeth are exposed to sugar.

# Sugar, continued

Caries development is positively associated with the following activities:

- Frequent or prolonged contact of the teeth with sugary substances.
- Consumption of sticky foods.
- Dipping a pacifier in sweeteners like honey or corn syrup.
- Regular use of medications that contain sucrose, including some multi-vitamins.



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# Sugar, continued

Caries risk is reduced when:

Teeth are brushed immediately after eating to remove sticky foods.

Fresh fruit, vegetables, and whole grain snacks are chosen instead of candy or juice.



# Enamel

Enamel is a physical barrier to bacterial invasion of the tooth.

Acid produced by bacteria on the teeth demineralizes the enamel.

When the enamel is weakened or less able to remineralize, the risk for caries is increased.

The health and strength of the enamel can be modified by changing health behaviors.



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# Dental Sealants

Outside the Early Childhood Caries (ECC) age range, the majority of caries develop on grooved surfaces of teeth—the pits and fissures of the molars.

This is why dental sealants are an effective method of caries prevention.



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# Saliva

Saliva has several important properties that help to protect against the majority of carious lesions:

- Saliva buffers acid.
- Saliva is bacteriostatic.
- Saliva aids in remineralizing the teeth.

## Saliva, continued

Decreased saliva production promotes development of caries.

Possible causes of limited saliva production include:

- Systemic diseases
- Salivary gland damage from surgery or radiation therapy
- Medication effects

## Saliva, continued

Medications are the most common cause of decreased saliva production in children.

Pediatricians need to be aware of this risk and choose medications carefully.



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# Early Childhood Caries (ECC)



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ECC is defined as the presence of 1 or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of 6.

ECC typically results in severe tooth morbidity and extensive restorative treatment needs.

# Early Childhood Caries, continued

ECC affects 24.7% of children in the United States.

ECC is concentrated among poor and minority children, with 80% of total tooth decay occurring in 25% of the nation's children.

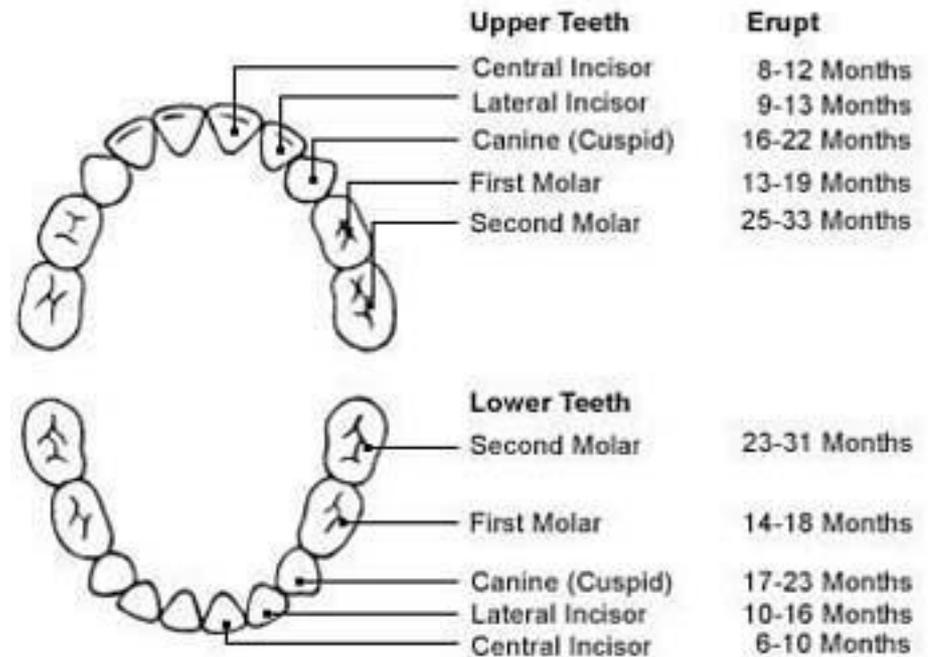


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# Pattern of primary tooth eruption

The typical pattern of primary tooth eruption is:

1. Lower central incisors
2. Upper central incisors
3. Lateral incisors
4. First molars
5. Canines (cuspids)
6. Second molars



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# Affected Teeth

ECC tends to affect the upper (maxillary) incisors first because they erupt earliest and are less protected by saliva.

The primary molars are affected next because of their grooved surfaces.

Plaque stagnates in the molar's pits and fissures, which are difficult areas to clean with a toothbrush.



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## Affected Teeth, continued



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The canines tend to be spared because they are smooth teeth that erupt later.

The lower teeth are better protected by saliva and the tongue.

# Diagnosis and Stages

The stages of ECC are as follows:

1. **Plaque:** This biofilm contains cariogenic bacteria.
2. **Incipient lesions or white spots:** Usually begin along the gum line, which is the most important place to examine for ECC. With intervention at this stage, the caries process is entirely reversible.
3. **Enamel caries:** A defect in the enamel surface is visible.
4. **Dentine caries:** ECC has extended into the dentine layer, where the nerve and pain fibers are located.
5. **Pulpitis:** The caries lesion has progressed so that it now affects the pulp.

# Impact and Effects on Health

ECC increases the risk of caries lesions developing in permanent teeth.

Other health effects include:

- Pain
- Difficulty chewing, which may lead to poor weight gain
- Difficulty speaking
- Oral infections
- Loss of sleep, difficulty concentrating, and interrupted learning
- Destruction and loss of teeth
- Damage to permanent teeth

# Impact and Effects on Health, continued



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ECC results in increased office, dental, and ER visits.

These costs far exceed those of preventive dental care.

It is 10 times more expensive to provide inpatient care for caries-related symptoms than to provide that same patient the recommended periodic preventive care.

# Risk Factors for ECC

## Social/Environmental Characteristics

- Ethnicity, minority or low socioeconomic status
- Parents with less than a high school education
- Limited or no dental insurance
- Limited or no access to dental care
- Inadequate fluoride exposure
- Caries in a parent or sibling (especially in the past 12 months)
- High levels of S mutans in parents

# Risk Factors for ECC, continued

## Physical Characteristics

- Children with special health care conditions
- Low birth weight (less than 2500 grams)
- Gingivitis
- Chronic conditions that weaken enamel, promote gingivitis, or cause decreased saliva production
- Visible plaque on the teeth

# Risk Factors for ECC, continued



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## Behavioral Risk Factors

- Poor nutritional/feeding habits
- Poor oral hygiene

# Preventing ECC

Physicians who care for children  
Should teach the following methods  
to prevent or delay caries:

1. Improve oral hygiene
2. Alter feeding/eating practices
3. Delay colonization of the teeth
4. Ensure adequate fluoride
5. Establish dental care, such as a dental home



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Albany Medical Center

In older high-risk children, encourage dental sealants

## Question #1

Through which of the following mechanisms does saliva inhibit caries formation?

- A. Supplying fluoride to aid in tooth remineralization
- B. Removal of dietary carbohydrates from tooth surfaces
- C. Buffering of acid
- D. Providing calcium and phosphate to aid in remineralizing the teeth
- E. All of the above

## Answer

Through which of the following mechanisms does saliva inhibit caries formation?

- A. Supplying fluoride to aid in tooth remineralization
- B. Removal of dietary carbohydrates from tooth surfaces
- C. Buffering of acid
- D. Providing calcium and phosphate to aid in remineralizing the teeth
- E. All of the above

## Question #2

**True or False? The risk of caries development is directly related to the frequency with which the teeth are exposed to sugar.**

- A. True
- B. False

## Answer

**True or False? The risk of caries development is directly related to the frequency with which the teeth are exposed to sugar.**

- A. True
- B. False

## Question #3

**Which of the following helps to prevent or delay dental caries?**

- A. Limiting snacks between meals
- B. Ensuring adequate fluoride
- C. Improving oral hygiene
- D. Establishing a dental home
- E. All of the above

## Answer

**Which of the following helps to prevent or delay dental caries?**

- A. Limiting snacks between meals
- B. Ensuring adequate fluoride
- C. Improving oral hygiene
- D. Establishing a dental home
- E. All of the above**

## Question #4

**Which teeth does Early Childhood Caries tend to affect first?**

- A. Mandibular molars
- B. Maxillary incisors
- C. Mandibular incisors
- D. Maxillary molars
- E. All teeth are equally affected

## Answer

**Which teeth does Early Childhood Caries tend to affect first?**

- A. Mandibular molars
- B. Maxillary incisors**
- C. Mandibular incisors
- D. Maxillary molars
- E. All teeth are equally affected

## Question #5

**Which of the following bacterial species is the primary pathogen implicated in the development of dental caries?**

- A. Streptococcus salivarius
- B. Streptococcus mutans
- C. Bacteroides sp.
- D. Streptococcus viridans
- E. Actinomyces sp.

## Answer

**Which of the following bacterial species is the primary pathogen implicated in the development of dental caries?**

- A. Streptococcus salivarius
- B. Streptococcus mutans**
- C. Bacteroides sp.
- D. Streptococcus viridans
- E. Actinomyces sp.

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