Dental Caries

Chapter Outline

Bacterial Infection
- Dental Plaque
- Enamel Structure

The Caries Process
- Stages of Caries Development
- Root Caries
- Secondary (Recurrent) Caries

Early Childhood Caries
- Risk Factors
- How Children Get Early Childhood Caries

The Importance of Saliva

Caries Diagnosis
- Dental Explorer
- Radiographs
- Visual Appearance
- Indicator Dyes
- Caries Detection Devices
- Laser Caries Detector

CAMBRA

PROCEDURE 13-1: Performing Caries Detection Using the KaVo DIAGNOdent Caries Detection Device (Expanded Function)

Methods of Caries Intervention

Caries Risk Assessment Tests

PROCEDURE 13-2: Performing Caries Risk Assessment (Expanded Function)

Legal and Ethical Implications

Eye to the Future

Critical Thinking

Key Terms

CAMBRA  Caries management by risk assessment.
Caries (KAR-eez)  The infectious disease process of tooth decay.
Caries Risk Test (CRT)  Test for cariogenic bacteria.
Cariology (KAR-ee-all-o-gee)  The science and study of dental caries.
Curious (KAR-ee-us) lesion  White spots, brown spots, decay on tooth surfaces.
Cavitation (ka-vi-TAY-shun)  Formation of a cavity or hole.
Demineralization (dee-min-ur-ul-i-ZAY-shun)  Loss of minerals from the tooth.
Early childhood caries (ECC)  Decay in any primary teeth.
Evidence based  Information based upon documented evidence from critically reviewed research.
Fermentable (fur-MEN-tuh-bul) carbohydrates  Simple carbohydrates, such as sucrose, fructose, lactose, and glucose.
Fluoride (FLOOR-ide)  Mineral used in dental products to make teeth more resistant to decay.
Incipient (in-SIP-ee-ent) caries  Tooth decay that is beginning to form or become apparent.
Lactobacilli (lak-toe-buh-SIL-eye)  Bacteria that produce lactic acid from carbohydrates.
Mutans streptococci (strep-toe-KOK-sye)  Type of bacteria primarily responsible for caries.
Pellicle (PEL-i-kul)  Thin film coating of salivary materials deposited on tooth surfaces.
Plaque (plak)  Soft deposit on teeth that consists of bacteria and bacterial by-products.
Rampant (RAM-punt) caries  Decay that develops rapidly and is widespread throughout the mouth.
Remineralization  Replacement of minerals in the tooth.
Saliva flow rate test  Determines flow rate of saliva in milliliters per minute.
Xerostomia (zeer-oe-STOE-mee-uh)  Dryness of the mouth caused by reduction of saliva.
Xylitol (ZY-li-toll) Ingredient in chewing gum that has an antibacterial effect against decay-causing bacteria.
Dental caries (tooth decay) is an infectious and communicable disease. It is a worldwide health concern, affecting humans of all ages. Dental caries is the single most common chronic disease in children. In fact, five times more children in the United States have untreated dental disease than have childhood asthma. This results in more than 50 million missed school hours every year. Caries is not just a child’s disease. Because of recession of the gingival tissues, many older adults experience root caries. This chapter discusses cariology, which includes the causes of caries, the process by which caries occurs, and the science and practice of caries management and prevention.

Caries has plagued humankind since the beginning of recorded history. Since the late nineteenth century, dentists have been fighting tooth decay by drilling out the decayed tooth structure and filling the tooth with a restorative material. Although this treatment eliminates decay that is already present, it does nothing to lower levels of bacteria in the mouth that may cause additional caries. Today, the emphasis in fighting caries is shifting from the traditional approach of restoring (filling) teeth to newer strategies of managing caries by determining the risk for caries in an individual, and then implementing appropriate methods of preventing future caries. Advances in science and new technologies have placed the emphasis on prevention and early intervention.

Bacterial Infection

Caries is a transmissible bacterial infection. The two specific groups of bacteria in the mouth that are responsible for caries are the mutans streptococci (MS) (Streptococcus mutans) and the lactobacilli (LB).

MS, which are considered to be major pathogenic (disease-producing) bacteria, are found in relatively large numbers in dental plaque. The presence of LB in a patient’s mouth indicates that the patient has a high sugar intake. MS and LB, separately or together, are the primary causative agents of caries.

It is important to note that the oral cavity of a newborn does not contain MS. However, these bacteria are transmitted through contact with saliva (most frequently the mother’s saliva) to the infant. Mothers are the most common source of disease-causing MS because of the close and frequent contact that takes place between mother and child during the first few years. For example, a mother kisses her baby and may also taste food on a spoon before giving it to her baby. Science has proved that when mothers have high counts of MS in their mouths, their infants have high counts of the same bacteria in their mouths. Children also may be infected by a caregiver or even by siblings.
Remember, caries is an infectious disease. When the number of caries-causing bacteria in the mouth increases, the risk for developing caries also increases.

**RECALL**

1. What two types of bacteria primarily cause dental caries?
2. Which of the above two types of bacteria is most responsible for dental caries?

### Dental Plaque

Dental plaque is a colorless, soft, sticky coating that adheres to the teeth (Fig. 13-1). MS and LB live and multiply within the dental plaque. If toothbrushing and flossing are not thorough, plaque remains attached to the tooth. Even self-cleansing movements of the tongue, or rinsing and spraying of the mouth with water or mouthwash, will not dislodge the plaque.

If you were to look at plaque under a microscope, you would see colonies of bacteria embedded in an adhesive substance called the pellicle. Formation of plaque on a tooth concentrates millions of microorganisms on that tooth. A milligram of wet plaque may contain as many as 200 to 500 million microorganisms. A similar amount of saliva flowing through the oral cavity contains less than 1 percent of this number of organisms, so it is clear that bacteria in plaque that is attached to the tooth are a major part of the problem.

### Enamel Structure

To gain an understanding of how bacterial infection leads to the caries process, it is important to review the structure of enamel. Enamel is the most highly mineralized tissue in the body, and it is stronger than bone. Refer to Chapter 8 for an in-depth discussion of the structure of enamel.

Enamel consists of microscopic crystals of hydroxyapatite arranged in structural layers or rods, also known as prisms. These crystals are surrounded by water, and primary teeth are made up of slightly more water than are permanent teeth. The water in enamel allows acids to flow into the tooth and minerals to flow out of the tooth. Carbonated apatite, a mineral in enamel, makes it easier for the tooth structure to dissolve.

**RECALL**

3. What is the soft, sticky bacterial mass that adheres to the teeth?
4. What is the mineral in the enamel that makes the crystal easier to dissolve?

### The Caries Process

Caries is a disease that is caused by multiple factors (Fig. 13-2). For caries to develop, the following three factors must be present at the same time:

1. A susceptible tooth.
2. A diet rich in fermentable carbohydrates.
3. Specific bacteria. (Regardless of other factors, caries cannot occur without the presence of bacteria.)

**The Caries Imbalance**

[Diagram of disease indicators, risk factors, protective factors, and caries progression]

**FIG. 13-2** Factors involved in the formation of carious defects. (Courtesy Dr. John D.B. Featherstone, School of Dentistry, University of California San Francisco.)
Bacteria in dental plaque feed on fermentable carbohydrates found in a regular diet, such as sugars (including fruit sugars) and cooked starch (e.g., bread, potatoes, rice, pasta). Just as human wastes are a by-product of eating, these bacteria produce acids as a by-product of their metabolism. Within about 5 minutes after eating or drinking, bacteria begin to produce acids as a by-product of their digesting your food. These acids can penetrate into the hard substance of the tooth and dissolve some of the minerals (calcium and phosphate). If acid attacks are infrequent and of short duration, saliva can help repair the damage by neutralizing the acids and supplying minerals and fluoride to replace those lost from the tooth. When fermentable carbohydrates are eaten frequently, more acid is produced and the risk for decay increases. If this process continues, caries develops.

Caries lesions can occur in four general areas of the tooth, as follows:

1. **Pit-and-fissure caries** occurs primarily on occlusal surfaces, on buccal and lingual grooves of posterior teeth, and on lingual pits of the maxillary incisors.
2. **Smooth surface caries** occurs on enamel surfaces, including mesial, distal, facial, and lingual surfaces.
3. **Root surface caries** occurs on any surface of the exposed root.
4. **Secondary caries, or recurrent caries**, occurs on the tooth that surrounds a restoration.

### Stages of Caries Development

It can take months or even years for a carious lesion to develop. Carious lesions occur when more minerals are lost (demineralization) from the enamel than are deposited (remineralization). **Demineralization** occurs when calcium and phosphate dissolve from hydroxyapatite crystals in the enamel. In **remineralization**, calcium and phosphate are redeposited in previously demineralized areas. The processes of demineralization and remineralization may occur without loss of tooth structure.

Dental caries is not simply a continual, cumulative loss of minerals from the tooth. Rather, caries is a dynamic, ongoing process that is characterized by alternating periods of demineralization and remineralization (Fig. 13-3).

Caries lesions develop in two distinct stages, as follows:

1. **Incipient caries** or incipient lesions, occurs when caries begins to demineralize the enamel (Fig. 13-4, A).
2. The second stage, the **overt lesion**, or frank lesion, is characterized by **cavitation**—the development of a cavity or a hole (Fig. 13-4, B).

**FIG. 13-4** A, Early carious lesion, or white spot of demineralization. B, Overt carious lesion. C, Rampant caries. (A, Courtesy Dr. John D.B. Featherstone, School of Dentistry, University of California San Francisco. B and C, Courtesy Dr. Frank Hodges, Santa Rosa, CA.)
How to Control Tooth Decay

**Diet:** Limit quantities of sugary and starchy foods, snacks, drinks, and candy (three snacks per day).
**Fluorides:** Fluorides help make the tooth resistant to being dissolved by acids (see Chapter 15).
**Remove plaque:** Perform thorough brushing and flossing to remove plaque from all tooth surfaces.
**Saliva:** Saliva neutralizes acids and provides minerals and proteins that protect the tooth. After you have had a snack, chew some sugar-free gum to increase the flow of saliva and neutralize acids. Choose gums that contain xylitol or gums that contain baking soda (see Chapter 15).
**Antibacterial mouth rinses:** The dentist can prescribe these rinses for patients who are at high risk for caries, to reduce the numbers of bacteria that cause tooth decay.
**Dental sealants:** Sealants are an excellent preventive measure that can be used for children and young adults who are at risk for decay (see Chapter 59).

At times, onset of the incipient lesion is followed rapidly by the development of cavitation, with multiple lesions throughout the mouth. This condition is known as **rampant caries** (Figs. 13-5 and 13-6; also see Fig. 13-4, C). Usually, rampant caries occurs after excessive and frequent intake of sucrose or after **xerostomia** (dry mouth).

### Root Caries

Root caries, which is becoming more prevalent, is a particular concern for elderly persons, who often have gingival recession that exposes root surfaces. People are living longer and are keeping their teeth longer, and older people often take medications that reduce salivary flow. Reduced flow of saliva is a risk factor for development of caries.

Carious lesions form more quickly on root surfaces than does coronal caries because the cementum on the root surface is softer than enamel or dentin. Also, root lesions have a different clinical appearance. Similar to coronal caries, root caries undergoes periods of demineralization and remineralization (Fig. 13-7).

### Secondary (Recurrent) Caries

Secondary, or recurrent, caries starts to form in tiny spaces between the tooth and the margins of a restoration. Bacteria are able to thrive in these areas. This type of caries is difficult to diagnose because it cannot be seen easily, and it cannot be detected with an explorer. Radiographs are required to detect this type of caries.

When dental restorations must be replaced, the reason is usually recurrent caries under the existing restoration. New restorative materials that bond to the tooth structure may help prevent recurrent decay by eliminating the tiny space between the tooth and the filling material, where microleakage can occur. Restorative materials that slowly release fluoride also can help to prevent secondary caries (Fig. 13-8).

### Early Childhood Caries

**Early childhood caries (ECC)** is an infectious disease that can happen in any family. Many children live with the constant pain of decayed teeth and swollen gums (Fig. 13-9). In some states, ECC affects one third of preschool children.

**FIG. 13-5** Severe decayed molar on a child.

**FIG. 13-6** Decay on the lingual surface of a maxillary lateral incisor.

**FIG. 13-7** Root surface caries. (Courtesy Dr. John D.B. Featherstone, School of Dentistry, University of California San Francisco.)
Tooth decay is the single most prevalent disease of childhood. Untreated tooth decay in children results in pain and infection. Children who suffer from ECC often miss school or are unable to concentrate when they are in school. ECC can also affect a child’s ability to sleep and overall health and well-being. Many children with severe ECC must be hospitalized for treatment, and this can be very expensive (Fig. 13-10). Early childhood caries can be prevented by providing appropriate education for parents and oral health-care for the child.

**Risk Factors**

ECC is common among families of lower socioeconomic status. The rate of untreated dental disease among low-income children aged two to five years is almost five times higher than that seen in high-income families. ECC is more common among particular ethnic groups (Fig. 13-11), in those families who have limited access to dental care, and in areas where water fluoridation is lacking. ECC is also more common among children with special needs.

**How Children Get Early Childhood Caries**

ECC is a transmissible disease. Bacteria present in the parent’s or caregiver’s mouth are passed to the child. It is important for parents to keep their own teeth healthy to keep their children’s teeth healthy. Parents should substitute healthful foods and snacks for those that are sugary, starchy, or sticky. If a baby sleeps with a bottle, the chances of decay are greater (Fig. 13-12). Baby bottle tooth decay is another term for ECC. Refer to Chapter 15 for additional information on prevention of ECC.

**The Importance of Saliva**

Saliva is like a miracle fluid that provides physical, chemical, and antibacterial protective measures for the teeth.

The physical protection is dependent on the water content in the saliva and the amount or flow of saliva. If enough saliva is present, it provides a cleansing effect. The fluid dilutes and removes acid components from the dental plaque. If the saliva is thick, it is less effective than a thin or more watery saliva in clearing carbohydrates.

The chemical protection provided by saliva is especially important because saliva contains calcium, phosphate, and fluoride. Saliva keeps calcium in the mouth, ready to be used during remineralization. Saliva also includes buffers, bicarbonate, phosphate, and small proteins that neutralize acids after fermentable carbohydrates are ingested.
The antibacterial protection provided by saliva depends on substances found within the saliva, such as immunoglobulins, that work against bacteria. However, if the bacterial count in the mouth becomes very high, these substances may not be able to provide enough antibacterial protection.

A good flow of saliva is necessary to control caries. If salivary function is reduced for any reason, such as illness, medication, or radiation therapy, the teeth are at increased risk for decay.

**RECALL**

9 What three protective mechanisms are produced by saliva?

## Caries Diagnosis

Accurately diagnosing early dental caries is a challenge for the dentist. The following methods are used to detect dental caries, and each has specific limitations. (Detection of dental caries is also discussed in Chapter 28.)

### Dental Explorer

When a sharp explorer tip is pressed into an area of suspected caries, it will “stick” when it is being removed. New
research shows that this technique has limitations on the occlusal surface.

**Radiographs**

Although useful for detection of interproximal caries, early caries on occlusal surfaces is not visible on radiographs. In addition, the extent of caries can be misdiagnosed easily because the caries is often two times deeper and more widespread than it appears on radiographs.

**Visual Appearance**

The appearance of darkly stained grooves in the teeth may indicate caries, although dark grooves may simply reveal a stain caused by coffee or tea. Gray shadowing underneath enamel can also indicate decay.

**Indicator Dyes**

Special dyes are available for use during operative procedures; these products, when applied to the inside of a preparation, can indicate through a color change whether decay remains (Fig. 13-13).

**Caries Detection Devices**

With new technology, several types of devices have been developed that can provide a higher level of discrimination in the diagnosis of dental caries. Some devices detect bacterial by-products and quantify sound signals to aid in caries detection; some detect differences in tooth structure and display the information on a screen (Fig. 13-14). Others have software that can be used to analyze density changes on digital radiographs and to outline potential lesions. Some systems are useful for detecting caries on both occlusal and interproximal surfaces of posterior teeth. However, none can be used independently to determine appropriate treatment. It is important to note that the dentist ultimately makes a diagnosis of caries, and no single instrument or technique in itself has been found to be 100% effective in all cases.

**Laser Caries Detector**

The laser caries detector is one type of newly developed device that is used to diagnose caries and reveal bacterial activity underneath the enamel surface (Fig. 13-15). The laser caries detector does not detect interproximal caries, subgingival caries, or secondary caries under crowns, inlays, or restorations. However, caries detectors may be used to aid in monitoring progression or arrestment of caries by comparing a patient’s readings from visit to visit.

When the laser beam passes through a change in the density of the tooth, it gives off a fluorescent light of different wavelengths. A clean, healthy tooth exhibits little or no fluorescence, resulting in very low readings (Figs. 13-16 and 13-17). The laser wavelength is translated into a number from 0 to 99 that appears on the face of the unit. See Procedure 13-1.

However, carious tooth structure shows higher degrees of fluorescence. As the amount of decay increases, readings reveal higher degrees of fluorescence. False-positives may arise because of fluorescence caused by plaque or calculus in the fissures, or as the result of discoloration or food debris lodged in or on the surface of the tooth. Therefore, one should not rely totally on the readings; the laser caries detector is not a stand-alone diagnostic tool (Table 13-1).
FIG. 13-15 A and B, The DIAGNodent directs a laser beam into the occlusal surface. C, The DIAGNodent pen is an even newer device that provides the same early caries detection in a more portable handheld device. D, The Dental treatment sequence. (Courtesy KaVo Dental, Charlotte, NC.)

Use of this laser has its limitations. For example, the laser cannot be used to diagnose interproximal caries because access to those surfaces is limited. It cannot detect caries located under dental sealants or under an amalgam restoration, although it can detect decay around the occlusal margins of a restoration.

**Calibration of the Tip**

Because of slight natural variations in the fluorescence of healthy tooth structure, it is recommended to establish a zero base line, specific to each patient.

**CAMBRA**

*Caries management by risk assessment (CAMBRA)* is an evidence-based strategy for preventive and reparative care for early dental caries that can be used in any dental office.

The goal of CAMBRA is to assess the risk of caries in an individual. A dental health professional first assesses an individual’s risk factors and protective factors, and then determines the level of risk for caries (low, moderate, high, or extreme). Based on the determined level of risk, the dental professional develops an individualized preventive plan for each patient. Then, depending on the patient’s level of risk, the dental health professional provides specific products and recommendations to prevent dental caries.

**CAMBRA Preventive Protocol**

- Risk assessment
- Fluoride application
- Dietary counseling
- Application of dental sealants
- Fluoridated drinking water, toothpastes, and rinses
- Xylitol gum
- Calcium phosphate products
- Professionally applied fluoride foams and varnishes

Refer to Chapter 15 for additional information.

**Methods of Caries Intervention**

Even though the dentist restores (fills) the carious tooth, the risk for further decay to that tooth remains. This is so because restoring teeth has no effect on bacteria that
Performing Caries Detection Using the KaVo DIAGNOdent Caries Detection Device (Expanded Function)

**PROCEDURE 13-1**

**PREREQUISITES FOR PERFORMING THIS PROCEDURE**
- Infection control protocol
- Patient communication skills
- Knowledge of oral anatomy
- Operator positioning
- Fulcrum positioning

**EQUIPMENT AND SUPPLIES**
- KaVo DIAGNOdent Caries Detection Device
- Disposable sleeve
- Prophy angle, bristle brush
- Sodium bicarbonate powder
- Pencil and patient's record

**Scanning Procedure**
1. Clean and dry the teeth using a prophy brush, or other acceptable means. **Purpose:** If debris remains, false-positive readings can occur. If this should occur, further cleaning is necessary.
2. Identify tooth surfaces to be tested.
3. During examination of suspicious sites, the tip of the handpiece should be in light contact with the surface of the tooth.
4. Place the probe tip directly on the pits and fissures, making sure the tip is in contact with the long axis of the tooth.
5. When the tip is in contact with the fissure, slowly rotate or rock the handpiece in a pendulum-like manner. **Note:** Areas of discoloration and enamel defects or areas may produce a sharp change in the audible signal.
6. Record the readings. **Note:** Very high readings (e.g., greater than 80) may indicate that the teeth have not been thoroughly cleaned or are not free of debris. In such situations, the teeth may be re-cleaned, dried, and re-examined.
7. After the scanning has been completed, hold the tip in the air and hold the gray ring switch until “Set 0” appears on the display. **Purpose:** This eliminates the previous patient-specific zero base line from the unit.

**PROCEDURAL STEPS**

**Establish Zero Base Line**
1. Before scanning, select an anatomic reference point on a healthy nonrestored tooth. The middle third facial surface is ideal.
2. Hold the probe tip against the tooth at right angles to the surface.
3. Gently squeeze the gray ring switch of the handpiece.
4. “Set 0” will appear on the display, confirmed by an audible beep. This indicates that the zero base line is established.
5. Record the anatomic location where the zero base line was established in the patient's dental record for future reference. **Example:** DIAGNOdent zero base line: midfacial #8
6. Document the procedure and the results in the patient's chart.
continue to live in the mouth. Dental caries occurs when more disease-causing agents (e.g., bacteria, fermentable carbohydrates) than protective agents (e.g., saliva, fluoride) are present in the mouth. The caries process can be interrupted or prevented in the following ways (Fig. 13-18):

- **Fluoride.** Various forms of fluoride are available to strengthen teeth against solubility and acid.
- **Antibacterial rinses.** For patients at high risk for caries, products such as chlorhexidine mouth rinses reduce the numbers of cariogenic bacteria in the mouth. Patients rinse once daily for one minute at bedtime. This should be repeated for one week every month.
- **Decreased fermentable carbohydrates.** Our diet today includes fast foods, frequent snacking, and regular intake of foods that have a high sugar content. All of these factors put teeth at risk for caries. It is important to reduce the quantity and frequency of fermentable carbohydrates in the diet.
- **Increased salivary flow.** Saliva can tilt the caries balance by neutralizing acids that cause demineralization; it can also aid in remineralization of tooth surfaces. Chewing sugarless gum with sweeteners such as aspartame or sorbitol, as well as newer types with the noncariogenic sweetener xylitol, increases the flow of saliva and thereby reduces the acid challenge to the teeth. Chewing one stick three times a day, preferably after meals, helps to neutralize any acids that are present and promotes remineralization.

These methods of caries intervention are discussed in greater detail in Chapter 15.

**Caries Risk Assessment Tests**

*Caries risk assessment* tests are used to identify the factors that contribute to an increased risk for dental caries. An example of a caries risk test is the saliva flow rate test. This test measures the amount of saliva in the mouth in milliliters per minute. The patient chews a paraffin pellet for 3 to 5 minutes and then spits all generated saliva into a paper cup. Using a pipette, measure the amount of saliva (in milliliters = ml) and divide that amount by the time, to determine the ml/minute of stimulated salivary flow. Flow rates of 1 ml/minute and above are considered normal. A level of 0.7 ml/minute is low, and a level of 0.5 ml/minute or less is dry, indicating a high risk for caries. Determining the reason for a low flow rate is an important step in patient treatment.

The commercial **Caries Risk Test (CRT)** is used to detect the numbers of MS and LB bacteria present in the saliva. High bacterial counts indicate a high caries risk, and low counts indicate a low risk for caries. Procedure 13-2 describes the steps involved in bacterial caries risk assessment.

By determining the patient’s risk for developing dental caries, and by beginning appropriate preventive treatment, the healthcare worker can prevent dental caries from occurring. Patients with high numbers of bacteria in the mouth are likely to develop carious lesions if preventive measures are not provided.
Performing Caries Risk Assessment (Expanded Function)

**PROCEDURE 13-2**

**PREREQUISITES FOR PERFORMING THIS PROCEDURE**

- Infection control protocol
- Patient communication skills

**EQUIPMENT AND SUPPLIES**

- CRT kit
- Paraffin pellet
- NaHCO₃ tablet (sodium, hydrogen, carbonate)
- Pipette
- Agar carrier
- Test vial
- Evaluation chart
- Paper cup
- Pen with waterproof ink
- Culture incubator

**PROCEDURAL STEPS**

1. Explain the procedure to the patient.  
   *Purpose:* To educate the patient about the process of caries risk assessment.

2. Have the patient chew the paraffin wax pellet.  
   *Purpose:* To stimulate salivation.

3. Have the patient expectorate into the paper cup.  
   *Purpose:* To collect the saliva sample.

4. Remove the agar carrier from the test vial, and place an NaHCO₃ tablet at the bottom of the vial.  
   *Purpose:* The NaHCO₃ tablet will determine the buffer capacity of the saliva.

5. Carefully remove the protective foils from the two agar surfaces. Do not touch the agar.  
   *Purpose:* To prevent contamination of the agar surfaces.

(continued)
PROCEDURE 13-2—cont’d

6 Thoroughly wet both agar surfaces using a pipette. Avoid scratching the agar surface. Hold the carrier at an angle while wetting. 
   Purpose: One side is sensitive to MS, and the other side is sensitive to LB.

7 Slide the agar carrier back into the vial, and close the vial tightly. 
   Purpose: To prevent cross-contamination of the sample.

8 Use a waterproof pen to note the name of the patient and the date on the lid of the vial.

9 Place the test vial upright in the incubator. Incubate at 37° C (99° F) for 49 hours. 
   Purpose: To allow bacteria on the agar strips to grow.

10 Remove the vial from the incubator.
11 Compare the density of the bacterial colonies versus corresponding evaluation pictures on the chart included in the CRT kit. 
   Tip: Hold the agar carrier at a slight angle under a light source, so colonies can be seen clearly.

A, Compare the density of the mutans streptococci (MS) colonies. B, Compare the density of the lactobacilli (LB) colonies.
Benefits of Caries Risk Assessment

• Assessment is easily done.
• In-office testing is cost-effective.
• Dental assistants can perform assessments.
• Plans for prevention can be individualized.
• Patients are motivated to undergo treatment.

Risk Factors for Future Dental Caries

• History of dental caries
• Presence of white spot lesions
• Poor oral hygiene
• High mutans streptococci count (test results)
• Lower socioeconomic status
• High daily consumption of sucrose

Candidates for Caries Risk Testing

• New patients with signs of caries activity
• Pregnant patients
• Patients experiencing a sudden increase in incidence of caries
• Individuals taking medications that may affect the flow of saliva
• Patients with xerostomia
• Patients with upcoming chemotherapy
• Patients who frequently consume fermentable carbohydrates
• Patients with disease of the immune system

Eye to the Future

Diagnosis of dental caries has become more challenging as knowledge of the disease has changed. More factors involved in the caries process have been identified. Risk factors are better understood, and better methods for detection are being developed. Methods are needed that can detect occlusal caries while it is still in the enamel and can be arrested by remineralization. It is important that strategies for the prevention of dental caries continue to be formulated.

It is anticipated that in the future, advances in molecular biology will provide dental professionals with a rapid method of assessing a patient’s risk for dental caries before the patient leaves the dental chair. Someday, it is likely that a vaccine will become available that will prevent dental caries.

Critical Thinking

1. Mr. Johnstone comes into your office reporting pain in a lower right first molar. The tooth has a large amalgam restoration that was placed 10 years ago. As you begin to take the radiograph, you do not see any visible decay. What is a possible cause for his pain?

2. The Williams twins are in your dental office for a routine checkup. Mrs. Williams informs you that they both eat the same quantity of sweets. However, Jeanne eats her sweets all at once, whereas Carol divides her sweets throughout the day. Which of the twins is most likely to have tooth decay? Why?

3. As a dental assistant, you have been asked to speak to a group of pregnant women regarding their dental health. Why is it important for pregnant women to have excellent dental health before their babies are born?

Legal and Ethical Implications

When should a carious lesion be observed, or treated with some preventive measure, or actually restored? This question has no single answer. This is an individual decision that the dentist must make for each patient, and it is based on sound professional judgment.

The dentist must analyze the patient’s diet, dental history, and oral hygiene regimen to determine which approach to tooth restoration is necessary. People with a high caries rate may need immediate restoration of lesions. On the other hand, for lesions that have been dormant for many years, the dentist may choose to watch for an additional time without dental intervention.

Professional opinions vary about whether small initial carious lesions in the teeth should be restored. Opinions range from the conservative preference for remineralizing initial lesions to a more aggressive approach of restoring all carious lesions. Each dentist must make his or her own decisions on the basis of the individual patient’s history and needs.