

## CareQuest Cariology Curriculum Instructor Guide

### Session 2: Understanding the Caries Process: Demineralization, Remineralization, and Biofilm Management

#### SESSION DETAILS

**Pedagogy:**

*Lecture:* Interactive Presentation

*In-Class Activity:*

1. What form of apatite is least soluble?

**Length:** 60 mins

*Extended Learning Module: Updating Your Knowledge of Dental Caries: Etiology Short Self-Paced Course (approximately 30 minutes)*

<https://learning.carequest.org/#/online-courses/590364f2-9950-49cd-94b1-c3cc3ff5614f>

**Description:**

Learners will investigate the pivotal role of fermentable carbohydrates and biofilm bacteria in the development of dental caries, emphasizing how fluoride, calcium, and phosphate contribute to enamel stability and support remineralization through saliva. The session explores plaque formation, ecological shifts within the oral microbiome, and the effects of repeated acidic challenges on enamel demineralization.

Students will analyze the role of mutans streptococci as key acidogenic and aciduric organisms associated with lesion initiation and understand how low pH environments favor their persistence and activity. By the end of the session, learners will understand the dynamic balance between demineralization and remineralization and how microscopic changes in enamel translate to clinical lesion development.

**Learning Objectives:**

- Explain how biofilm metabolism of fermentable carbohydrates leads to acid production and repeated pH fluctuations.
- Describe how diffusion and critical pH contribute to subsurface enamel demineralization.
- Differentiate between demineralization and remineralization at the crystal level, including the role of fluoride in reducing enamel solubility.
- Relate microscopic changes in enamel to clinical presentation, including white spot lesions and D1–D4 classification.
- Describe how shifts in biofilm composition contribute to lesion initiation and progression.

## PRE-SESSION PREP CHECKLIST

### Reading:

- [Essentials of Dental Caries](#), Kidd *et al.*, chapters 2.4, 2.6, 2.7, 4.2, and 4.3

### Asynchronous:

- CareQuest Self-Paced Education, [“Updating Your Knowledge of Dental Caries: Causes, Concerns, and Considerations”](#)

## SYNCHRONOUS CLASS TIMING LESSON PLAN

- Opening and Framing [5 minutes]
- Biofilm and Bacterial Role [15 minutes]
- pH and Caries Dynamics [10 minutes]
- Tooth Structure and Susceptibility [5 minutes]
- Demineralization Process [10 minutes]
- Remineralization Process [10 minutes]
- Wrap Up and Caries Disease Understanding [5 minutes]

| LESSON OUTLINE   | INSTRUCTIONAL PROMPTS   |
|--|---|
| <p><b>Opening</b><br/>[Lecture, 5 minutes]</p>                     | <p><b>Slide 1:</b> Set the mindset for the course<br/>Introduce caries as a process, not an endpoint.<br/><b>Slide 2:</b> Learning objectives (brief).</p>  |
| <p><b>Biofilm and Bacterial Role</b><br/>[Lecture, 15 minutes]</p> | <p><b>Slides 3–5:</b> Address slide notes. Key takeaways:</p> <ul style="list-style-type: none"> <li>• Caries begins when biofilm bacteria metabolize carbohydrates and produce acid.</li> <li>• The pellicle allows initial bacterial attachment, leading to structured biofilm.</li> <li>• Biofilm is organized and protective, making it more resistant to disruption.</li> </ul> <p><b>Slides 6–10:</b> Address slide notes. Key takeaways:</p> <ul style="list-style-type: none"> <li>• Mutans streptococci initiate caries; lactobacilli contribute to progression.</li> <li>• Cariogenic bacteria are acid-producing, acid-tolerant, and adhesive.</li> <li>• Even a small proportion of these bacteria can shift the environment toward disease.</li> </ul> |

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| <p><b>pH and Caries Dynamics</b><br/>[Lecture, 10 minutes]</p>                  | <p><b>Slides 11–12:</b> Address slide notes. Connect behavior to disease.</p> <ul style="list-style-type: none"> <li>• Walk through the Stephan curve concept (pH drop and recovery).</li> <li>• Emphasize frequency of sugar exposure over quantity.</li> <li>• Clarify differences in sugars but keep bringing it back to how often the biofilm is fed.</li> </ul> <p><b>Slide 13–14:</b> Address slide notes. Emphasize:</p> <ul style="list-style-type: none"> <li>• Caries is a diffusion-controlled process: acid moves in, minerals move out.</li> <li>• Repeated low pH favors aciduric bacteria, shifting the biofilm composition.</li> </ul> |
| <p><b>Tooth Structure and Susceptibility</b><br/>[Lecture, 5 minutes]</p>       | <p><b>Slides 15–16:</b> Build structural understanding</p> <ul style="list-style-type: none"> <li>• Compare enamel and dentin to show why progression speeds up once dentin is involved.</li> <li>• Emphasize enamel as highly mineralized but pH sensitive.</li> </ul>  |
| <p><b>Deminerlization Process</b><br/>[Lecture, 10 minutes]</p>                 | <p><b>Slides 17–20:</b> Explain that demineralization starts below the surface, not on top. Use crystal images to show loss of structure and increasing porosity. Reinforce that damage begins before we can clinically detect it.</p> <p><b>Slides 21–23:</b> Stress that early lesions are subsurface and not detectable with an explorer. Introduce white spot lesions as the first visible clinical sign.</p>  |
| <p><b>Remineralization Process</b><br/>[Discussion, 10 minutes]</p>             | <p><b>Slides 24–26:</b> Shift to prevention mindset:</p> <ul style="list-style-type: none"> <li>• Explain the role of saliva (calcium, phosphate) and fluoride.</li> <li>• Reinforce why we preserve the surface layer—it allows remineralization to occur.</li> </ul> <p><b>Slides 27–28:</b> Prompt: “What form of apatite is least soluble?” Take a vote and have 2 or 3 students explain why they chose the answer they did.</p>   |
| <p><b>Wrap Up and Caries Disease Understanding</b><br/>[Lecture, 5 minutes]</p> | <p><b>Slide 29–31:</b> Bring it back to patient care:</p> <ul style="list-style-type: none"> <li>• Walk through D1–D4 progression.</li> <li>• Reinforce that caries is chronic and can progress over time without intervention.</li> <li>• Clearly distinguish caries vs erosion.</li> </ul>   |

