Streptococcus Mutans & Lactobacillus

Bacteria causing Periodontal disease and dental carries

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History

- **Streptococcus Mutans**
  - Expanded the time agriculture expanded
  - Approximately 10,000 years ago
  - Industrial revolution increased prevalence with refined sugar
    - (Stanford Department of Genetics)

- **Lactobacillus**
  - “L. acidophilus was discovered in the early 1900’s by Ernst Moro. Dr. Moro was a pediatrician that carefully studied his child patients, taking a lot of time to research gastrointestinal disorders that would plague the infants and children. (Hallnet)”
Case Example Periodontitis

Periodontal Disease

“My fourth patient today is Martin, a 47-year-old male nonsmoker with a history of gingivitis. He reports a loose tooth, bad breath, and bleeding gingivae. His last visit was several years ago. Dr. Lee to Martin: “Hi Martin. The last time I saw you, your gums were swollen and painful.”

“You have some supporting bone loss, which is causing the loose tooth. Your gums are receding, and your gum pockets are deeper than normal. The gingivitis that we saw at your last visit has become a more serious form of gum disease called “periodontitis”.

“Periodontitis, or periodontal disease, is a form of irreversible gingival disease that affects the tissues and structures surrounding and supporting the teeth, and it requires professional treatment.”

“Poor oral hygiene habits cause plaque and calculus to accumulate, and the periodontal disease process begins. Bacterial infection causes the gum pockets to become inflamed, as they were on your last visit. Over time, the tissue begins to atrophy, gums recede, gingival pockets deepen, and the levels of supporting bone decrease. This is why your tooth is loose. If untreated, this tooth and others may fall out.”

(Hemingway)
Case Example Periodontitis

Image shows change in bone around teeth
Case Example Dental Carries

“Mr. D: 24-year-old single, Caucasian male presenting for a “checkup and cleaning.” He has had no routine dental hygiene care in over six years (Newcomb)”

“Generally eats prepackaged meals or fast food (high in fat, sodium, and carbohydrates) “picked up” on the way home from work; rarely eats fruits or fresh vegetables; typically eats in front of the TV (sometimes falling asleep on the couch without brushing teeth), Reports drinking at least 12 sugared carbonated soft drinks per day. (Newcomb)”

“Reports teeth are getting brown (Newcomb)”
  ▶ Typical case has sensitivity to sugary substances

“Dental Hygienist went over proper diet and oral care. (brushing twice a day and flossing once a day)(Newcomb)”

“4 Selective polishing is indicated with fluoride varnish applied after treatment (Newcomb)”
  ▶ Filling or crown is used if too big to remineralize
Case Example Dental Caries

Dark areas on the crown of the tooth indicated by arrow
Dental Caries

- **Streptococcus Mutans**
  - “*S. mutans* are non-motile Gram positive cocci bacteria. (Bisla)”
  - “They are 0.5-0.75 micrometers in diameter, occurring in pairs, short medium length chains, without capsules. (Bisla)”
  - “First, they colonize on tooth surfaces. Second, they synthesize insoluble polysaccharides from sucrose. This allows adhesion to smooth surfaces and appears to be important in the formation of smooth surface caries. Third, they ferment sucrose to form lactic acid. (Bisla)”
  - Has biofilm that helps it attach to the teeth (plaque) (Bisla)
  - not motile

- **Lactobacillus**
  - “*Lactobacillus* are gram positive bacteria, non-spore forming rods. They normally constitute only a small fraction of plaque flora when compared to *S. mutans*. *Lactobacillus* species are not important in the initiation of caries but in the continuation (Bisla)”
  - Use the same process of converting sucrose into acid demineralizing teeth. (Bisla)
  - Has biofilm to help attach to the teeth (plaque) (Bisla)
  - not motile
**Periodontal Disease**

- “Plaque that is not removed can harden and form “tartar” that brushing doesn’t clean. Only a professional cleaning by a dentist or dental hygienist can remove tartar. ("Periodontal (Gum) Disease: Causes, Symptoms, and Treatments")”

- “The longer plaque and tartar are on teeth, the more harmful they become. The bacteria cause inflammation of the gums that is called “gingivitis.” In gingivitis, the gums become red, swollen and can bleed easily. Gingivitis is a mild form of gum disease that can usually be reversed with daily brushing and flossing, and regular cleaning by a dentist or dental hygienist. ("Periodontal (Gum) Disease: Causes, Symptoms, and Treatments")”

- “When gingivitis is not treated, it can advance to “periodontitis” (which means “inflammation around the tooth”). In periodontitis, gums pull away from the teeth and form spaces (called “pockets”) that become infected. Bacterial toxins and the body’s natural response to infection start to break down the bone and connective tissue that hold teeth in place. If not treated, the bones, gums, and tissue that support the teeth are destroyed. ("Periodontal (Gum) Disease: Causes, Symptoms, and Treatments")”
Description of bacteria

**Streptococcus Mutans**

**Lactobacillus**
Pathology

- **Dental Caries**
  - The acid secreted by *Streptococcus Mutans* and *Lactobacillus* deteriorates the enamel of the tooth. This causes dental caries.
  - This causes sensitivity to sugars, cool substances, and air.

- **Periodontal Disease**
  - The acid secreted also can cause gingivitis (inflammation of the gums) which allows the bacteria to get in to the gums causing pocket for the bacteria to collect. When the bacteria collects it begins to deteriorate the bone in between the gums.
  - “Causes loose teeth and possible tooth lose if not taken care of. Sensitive teeth, receding gums, painful chewing, red swollen gums. ("Periodontal (Gum) Disease: Causes, Symptoms, and Treatments")"
Incubation period

- The *S. mutans* isolates were grown on sucrose, glucose and xylitol as only carbon source, pH was found drop from 7.2 to 4.3 with sucrose and 3.7 with glucose, while no change on pH when used xylitol as only carbon source after 60h. from incubation period. (El-Sherbiny)
Mode of transmission

- There is no mode of transmission since it is caused form natural flora of the mouth.
- Sugar starts the fermentation process creating lactic acid which deteriorates the tooth and surrounding structures.
Diagnosis Process

- **Dental caries**
  - Dentist asks about tooth sensitivity or pain
  - Dentist probes teeth for soft areas
  - Examining Mouth and teeth and looking at x-rays
- **Periodontal Disease**
  - Looking at x-rays
  - Using tool to measure pocket depth between gums and teeth.
Methods of prevention and treatment

- **Prevention**
  - Brushing twice a day to remove plaque.
  - Flossing once per day to remove plaque from between the teeth.
  - Visiting the dentist/dental hygienist every 6 months to remove plaque underneath the gums.
  - Reduce sugary substances.

- **Periodontal Disease Treatment**
  - Root planning and scaling to remove tartar (build up of bacteria)
  - Medication (antibacterial)
  - Flap surgery-Lifting back gums to remove tartar and then suturing them back.
  - Bone and tissue graft-natural or synthetic bone placed to help grow bone between teeth
  - ("Periodontal (Gum) Disease: Causes, Symptoms, and Treatments")
Methods of prevention and treatment

- Treatment of Dental Caries
  - Fluoride treatment for minor cavities
  - Fillings of various material for mild cavities
  - Crowns for extensive decay that replace the crown or top part of tooth.
  - Root canal for extensive decay. Root is replaced with filling material
  - Extraction for very extensive decay. Removal of the tooth
- (Mayoclinic)
Number of cases

- **Dental Caries**
  - “Worldwide, 60-90% of school children and nearly 100% of adults have dental cavities. (“Oral health”)”

- **Periodontal Disease**
  - “Severe periodontal (gum) disease, which may result in tooth loss, is found in 15-20% of middle-aged (35-44 years) adults. (“Oral health”)”
Citations

  - Has information about Lactobacillus and what it does/ what it is.

  - Has information about Streptococcus Mutans and what it does/ what it is

  - Shows the job responsibilities in a dental office through a case.

  - Shows the job responsibilities in a dental office through a case.
   Shows prevention, history, and information about bacteria and what they do to cause Dental Caries.

   Causes, symptoms, and treatment of periodontal disease.

   Talks about the cause, prevention, diagnosis, prevention, and treatment of dental caries

   In-depth research about Streptococcus Mutans
More Citations

  - Health facts and statistics about dental diseases