Dental Bacteria and Alzheimer’s Disease

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The Session Objectives

1. Associate oral bacteria with the formation of amyloid plaques in the brain.
2. Implement methods to reduce oral bacteria and maintain oral health.

Alzheimer’s Disease Review

Alzheimer’s disease is a neurodegenerative disease exhibiting inflammation consistent with infection.

- Early onset familial Alzheimer’s disease = 3% of cases
- Late onset Alzheimer’s disease = 97% of cases
- 65 and older

Alzheimer’s disease is thought to begin 20 years or more before symptoms arise.
Alzheimer’s Disease Review

Neurons involved in thinking, learning and memory have been damaged or destroyed.²

- There is interference of neuron-to-neuron communication at synapses, leading to cell death due to the accumulation of beta-amyloid outside neurons.²

Risk Factors for Alzheimer’s Disease

Non-modifiable
- age²
- APOE-ε4 gene²
- family history of Alzheimer’s disease²

Modifiable
- fewer years of formal education²
- diabetes, obesity, smoking and hypertension²
- periodontitis³
- infection with Porphyromonas gingivalis³

Periodontal Disease Explanation

Bacterial diseases affecting the tissues around the teeth:

1. Gingivitis
   - infection confined to the gingiva
   - destruction of tissues is reversible
   - precursor to periodontitis²

2. Periodontitis
   - chronic infection of the gingiva, bone, periodontal ligament, & cementum
   - irreversible destruction of tissues
   - periods of increased tissue loss and remission
Porphyromonas gingivalis and Periodontitis

- A gram-negative anaerobic bacteria found mainly in those with periodontitis
  - nonmotile
- Also found at low levels in 25% of individuals without periodontal disease

P. gingivalis' Virulence Factor

Gingipain is an enzyme secreted by P. gingivalis
- allows for colonization of P. gingivalis
- inactivates the host defenses
- destroys brain tissue

P. gingivalis on the Move

Researchers analyzed brain tissue in deceased individuals as well as spinal fluid and saliva from patients with Alzheimer's disease
- P. gingivalis was found in the brain tissue during autopsies and in spinal fluid while alive
- gingipain was found in 96% of the brain tissue samples of those who died from Alzheimer's disease

Science Advances, January 2019
Primary Way *P. gingivalis* Travels From the Mouth to the Brain

**Blood Stream**

- transient bacteremia can occur during brushing, flossing, chewing, and during dental procedures
- results in translocation of bacteria to other body systems
- coronary arteries, placenta, liver, brain, cerebrospinal fluid

Other Ways *P. gingivalis* Travels From the Mouth to the Brain

1. infection of monocytes that are recruited to the brain
2. direct infection and damage to endothelial cells protecting the blood-brain barrier
3. infection of and spreading through cranial nerves to the brain

After entering the brain, *P. gingivalis* may spread slowly over many years from neuron to neuron along connected pathways.

The presence of *P. gingivalis* in the brain increases the production of amyloid beta, a component of the amyloid plaques that contribute to Alzheimer's disease.
Gingipains are released from the bacterial cell wall
Drives inflammation
ASC specks aggregate in monocytes that are infected with P. gingivalis
Formation of amyloid plaques

P. gingivalis and Plaque Formation in the Brain

Treatment of P. gingivalis

Broad-spectrum antibiotics do not protect against P. gingivalis-induced cell death nor do they clear P. gingivalis from the brain³
- P. gingivalis rapidly develops resistance to broad-spectrum antibiotics

Orally administered gingipain inhibitors protect against cell death and clear P. gingivalis from the brain³

Future Research is Required

Additional research is needed to understand the complete etiology of Alzheimer’s disease and how oral bacteria can allow for its progression.

- There is an upcoming phase II clinical trial to determine if inhibiting gingipains hinders the development and progression of Alzheimer’s disease.³
- Sampling cerebrospinal fluid of living subjects may serve as a differential diagnostic marker of Alzheimer’s disease.³
  - a window into brain infection
These findings present strong evidence of how crucial it is to manage periodontal disease in adults or individuals who have increased risk for Alzheimer’s disease.

- 68% of individuals 65 and older have periodontal disease.
- Individuals with periodontal disease for more than 10 years are at a 70% higher risk of developing Alzheimer’s disease than peers without periodontal disease.

**P. gingivalis Oral Infection Precedes the Onset of Alzheimer’s Disease**

Brain infection with *P. gingivalis* is not a result of poor dental care following the onset of dementia or a consequence of late-stage disease.

- It is an early event that can be used to explain the pathology found in middle-aged individuals before cognitive decline occurs.
- Remember that Alzheimer’s disease is thought to begin 20 years or more before symptoms arise.
Periodontal Disease Treatment

Nonsurgical Therapy
- recommended for gingivitis and mild-moderate periodontitis
- involves removal of plaque and tartar from all tooth surfaces
- performed by a dental hygienist

Surgical Therapy
- recommended for severe periodontitis
- involves removal of plaque and tartar from all tooth surfaces through surgical methods—flap back the tissue to access deep pockets
- may involve removal of bone or gingiva, grafting of bone or gingiva
- performed by a periodontist

Outcomes of Periodontal Disease

When treated, gingivitis can revert to healthy tissue alongside proper care at home
- without proper care at home and treatment, gingivitis may progress to periodontitis

Periodontitis that is treated may remain stable with maintenance visits and proper care at home
- without these treatments, periodontitis will progress, eventually leading to tooth loss

Visiting the Dentist Twice a Year may no Longer be Enough
- maintenance requires treatment (cleaning) every 3-6 months
- history of gingivitis requires 4-6 month recall
- history of periodontitis requires 3 month recall

Dental insurance may not cover the entire cost of maintenance
- the cost of a maintenance session is $100 or more

If you have a family history of cognitive impairment, that may be the deciding factor to accept treatment and maintenance therapy.
Identifying *P. gingivalis* in the Mouth

MyPerioPath® is a saliva test for detection of 11 oral bacteria that cause periodontal disease and threaten systemic health.
- cardiovascular disease
- diabetes
- stroke

Sample Report
https://www.oraldna.com/test/myperiopath/

Prevention of Periodontal Disease

- Remove all plaque from teeth and gum tissues daily
- Do not use tobacco or nicotine
- Control diabetes and weight

Ways to Remove Oral Bacteria

- **brushing teeth**: twice daily for 2 minutes with toothpaste designed to reduce plaque (a new brush every 3 months)
- **interdental device**: floss, floss pick, interdental brush, oral irrigator
- **tongue scraper**: twice daily
Ways to **Reduce** Oral Bacteria

- mouthrinse
- toothpaste
- xylitol

**Ensure You Did Your Best**

- Go back over areas that feel “fuzzy”
- Spend more time on areas that bleed
- Ask your dental professional for suggestions to improve
- Know your periodontal status

**Sources**