

The Diabetes-Oral Health Connection



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Common Infections in the oral cavity

- Caries
- Periapical lesions-nonvital teeth
- Fungal and viral infections
- Gingivitis
- Periodontitis



B Crane 1997

Initiation and Progression of Periodontitis

		<p>Normal, Healthy Gingiva (Gums)</p> <p>Healthy gums; periodontal ligament and bone anchor teeth firmly in place.</p>
		<p>Gingivitis</p> <p>Plaque and its byproducts irritate the gums, making them tender, inflamed and likely to bleed. Unremoved, plaque hardens into calculus (tartar).</p>
		<p>Periodontitis</p> <p>In time, as plaque and calculus build up along the gum line, plaque's bacteria begin to breakdown the connection between the supporting soft tissues and the tooth. As the disease progresses, bacteria begin to attack the bone tissue as well.</p>
		<p>Advanced Periodontitis</p> <p>The gums can recede as more bone and the periodontal ligament are destroyed. Teeth — even teeth without decay — may become loose and need to be extracted.</p>

Healthy Gums



Diabetic with gingivitis



Diabetic with mild periodontitis upper arch, moderate periodontitis lower arch.



Diabetic with severe periodontitis



Prevalence of periodontitis:

Conservative estimate, US adults with teeth:

- 22%- mild to moderate form
- 13%- severe form

NHANES III, n=9689, Albandar JP 1999

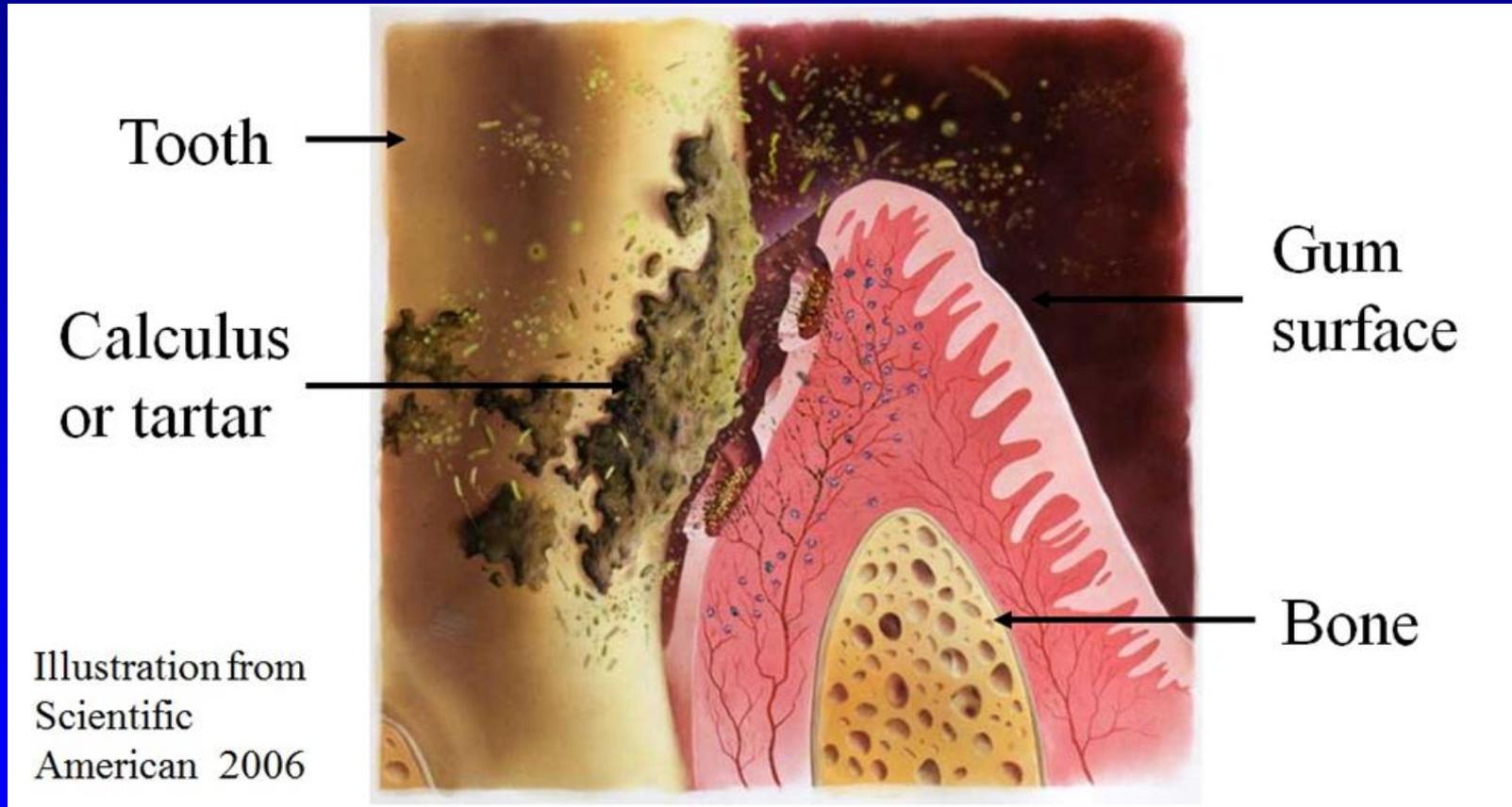
- 42% of dentate adults age 35-44 had mild to moderate perio disease and 26% had the severe form

1999 IHS Oral Health Survey

Initiation and Progression of Periodontitis

Periodontitis is initiated by specific bacteria that activate a series of inflammatory and immunologic changes leading to destruction of connective tissue and bone.

Ulcerated epithelium within infected periodontal pockets allows bacteria, toxins, and inflammatory mediators access to the blood stream.



Moderate periodontitis



Estimated 10-20cm² ulcerated surface and area of tissue necrosis

Hujoel 2001

4 cm² foot ulcer- 3-5X smaller than
the ulcerated epithelium within
infected periodontal pockets



Infectious disease can cause changes at distant body sites.

- “Oral bacteria can explain most, if not all, of the illnesses of mankind.” Miller, 1880
- “Focal Infection Theory” in the 1920’s-1940’s.
- The oral cavity is a portal of entry as well as the site of disease for microbial infections that affect general health status. Surgeon General’s Report on Oral Health in America, 2000
- Periodontitis is an anaerobic infection flooding the blood stream 24 hours a day with endotoxins and inflammatory mediators. Offenbacher, 1998

Workshop on Inflammation 2008

- Experts on inflammation from around the world.
- Periodontitis is a bacterially induced chronic inflammatory disease.
- Inflammatory mechanisms appear to be critical factors in the development and progression of most of the chronic diseases of aging.
- Periodontitis, DM, CVD, Alzheimer's, Parkinsons, and RA are all interrelated through inflammation.

Periodontal Treatment Terminology

- Gingivitis- “Prophy” or “prophylaxis”. “Cleaning.”
- Periodontitis-
 - “Deep scale” or “SRP” (Scaling and root planing)- often under topical or local anesthetic to numb the gums.
 - “Flap curettage-” surgery to expose the teeth and roots to remove the calculus that was under the gums.
 - “Regeneration” or “bone grafting-” surgery to rebuild the bone around the teeth.

Initial Therapy – Lower anterior - SRP



Recall – lower front teeth
No inflammation, local or systemic



Recall – history of severe periodontitis
but no local or systemic inflammation.



Diabetes and Periodontitis

Epidemiologic Studies in Pimas

Shlossman, Emrich, Knowler, Nelson, Taylor, and others

- Diabetics had 3 times greater attachment loss and bone loss than non-diabetics.
- Destructive periodontitis occurred much earlier in life in the diabetics (27% of diabetics 15-19 years old).
- 11-fold increased risk of progressive bone loss in poorly controlled diabetics.
- They were 15X more likely to lose all their teeth.

Diabetes and Periodontitis

A review of 55 studies involving subjects with diabetes found consistent evidence of increased:

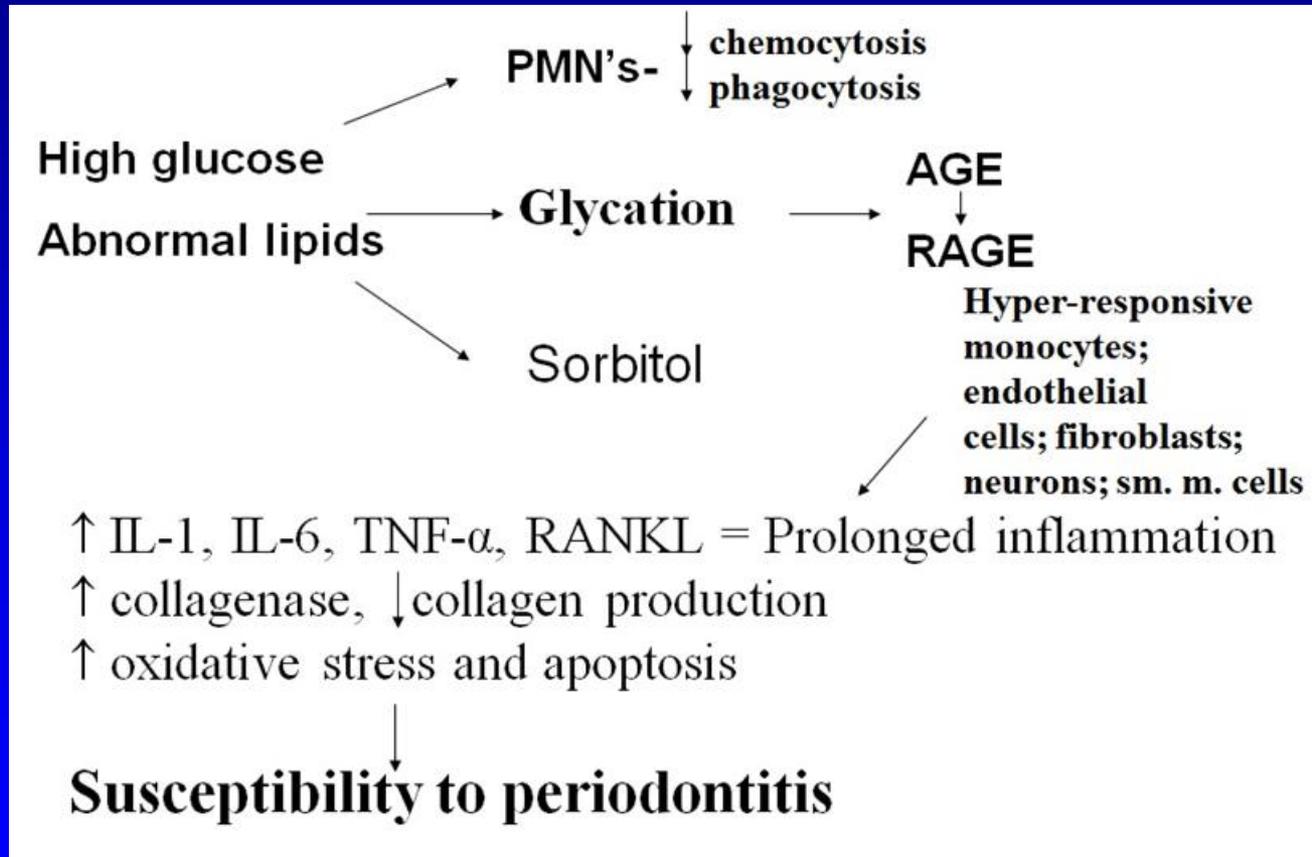
- Prevalence of periodontitis
- Incidence of periodontitis
- Severity of periodontitis
- Extent of periodontitis
- Progression of periodontitis

Taylor, CCED 2004

Taylor, Oral Diseases 2008

Dose-response relationship-as glycemic control worsens, periodontitis worsens.

Periodontal destruction in diabetes



Gingival polyps/granulomatous tissue



Diabetic non-smoker

Periodontal abscess #27



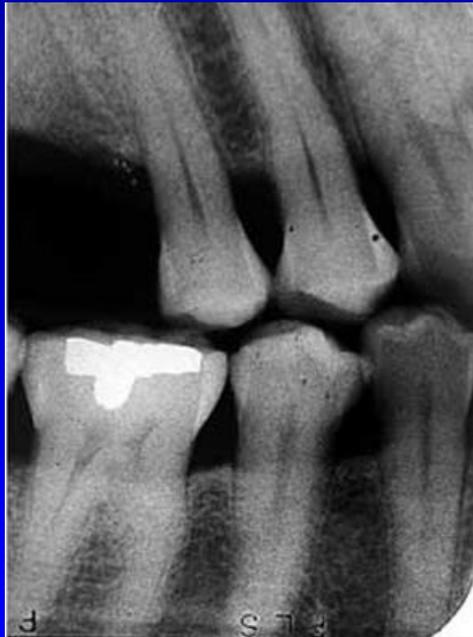
Diabetic with gingival overgrowth



42 year old female with uncontrolled DM Blood sugar averages 300-400mg/dl

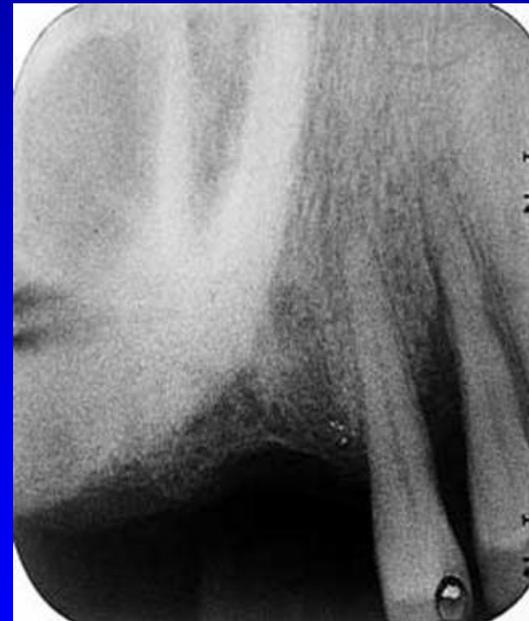
Mild Periodontitis

5-26-00



Severe Periodontitis

6-7-02



The 2 Way Relationship:

- Diabetes clearly increases risk for periodontitis.
- Does periodontitis increase risk for:
 - Poorer glycemic control?
 - Increased CV and kidney disease?
 - Mortality?

Periodontitis aggravates diabetes and its complications

- Diabetic subjects had a 6-fold increased risk of a worsening of HbA1c over 2-3 years when severe periodontitis was present at baseline.

Pima study. Taylor et al, JOP 96

- Findings confirmed of increased risk in Type 2 DMs with severe perio disease.

Collins 1998

- Patients with IDDM had sig. higher prevalence of proteinuria and cardiovascular complications such as stroke, TIA, angina, and MI when severe perio was present at baseline.

Thorstensson J Clin Perio 1996

Periodontal disease is a strong predictor of mortality from ischemic heart disease and diabetic nephropathy in Pimas with type 2 diabetes

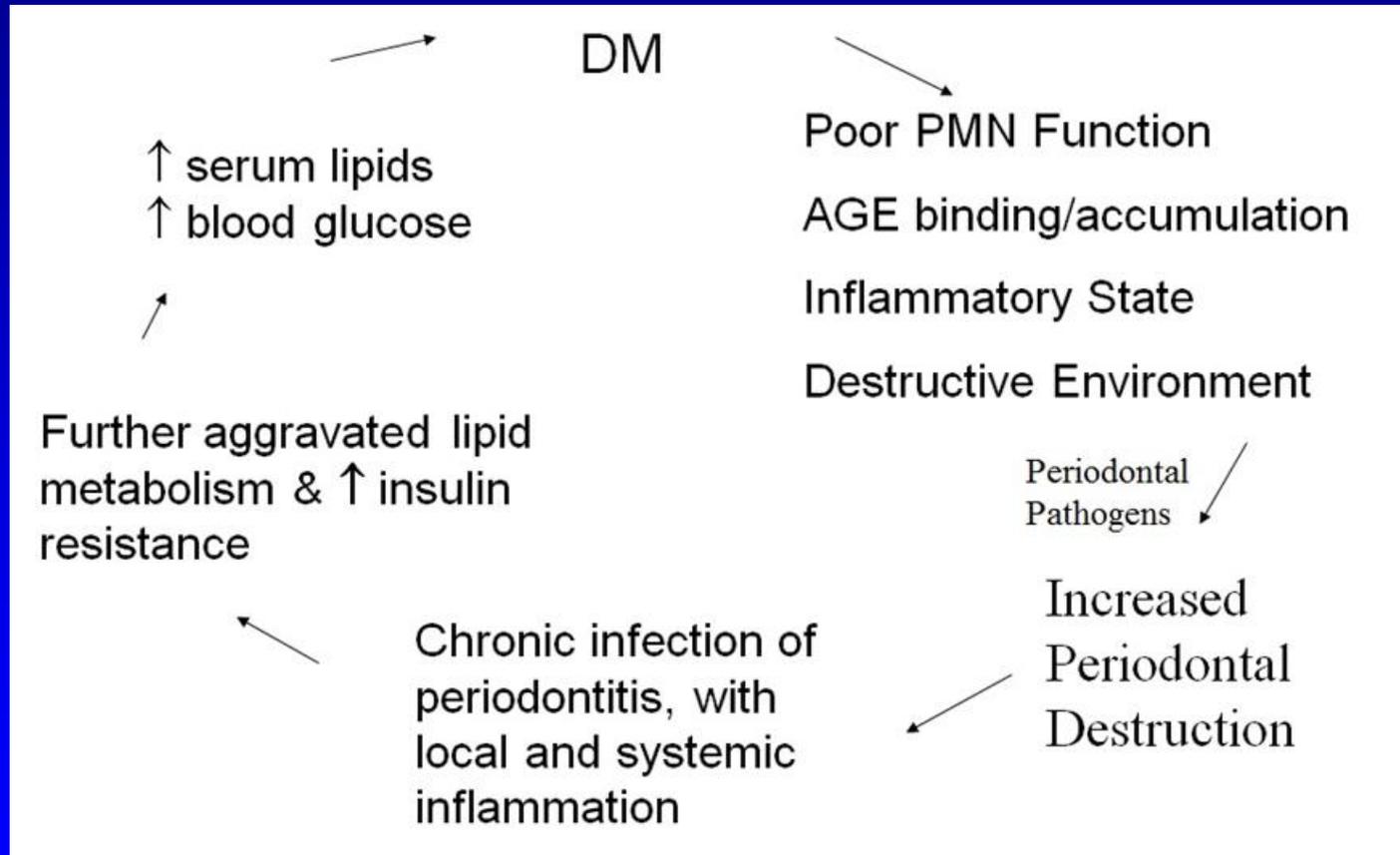
- Prospective longitudinal study (median 11 years) on the effect of periodontitis on cardiovascular mortality.
- After adjusting for many factors, for IHD:
 - No/mild perio 0 deaths/1000 person-years
 - Moderate perio 4.8 deaths/1000 person-years
 - Severe perio 5.7 deaths/1000 person years
- For deaths from diabetic nephropathy, there were 0, 0.5, and 5.3 deaths/1000 person-years for no, moderate, and severe perio respectively ($p < 0.01$)
- (Severe perio = 2.3 X higher risk of cardio mortality
8.5 X higher risk of renal mortality)

Saremi et al, Diabetes Care 2005, n= 628

Effect of periodontitis on overt nephropathy and ESRD in type 2 diabetics. Shultis et al, Diabetes Care 2007 n=529

- Incidence of macroalbuminuria and ESRD increased with severity of periodontitis.
- After adjusting for many factors, compared to those periodontally healthy:
 - Moderate perio OR ESRD 2.3
 - Severe perio OR ESRD 3.5
- Conclusion: Periodontitis predicts development of overt nephropathy and ESRD in a dose dependent manner in individuals with type 2 DM.

DM and Periodontitis – The 2 Way Relationship



The 2 Way Relationship:



Can treating the periodontal inflammation and infection improve the diabetic condition?

Periodontal therapy and diabetic control:

Recent reviews and meta analyses:

- *Janket et al JDR 2005*
Meta analysis of 10 intervention trials. NS but HbA1c decreased 0.7% with abx, 0.4% without.
- *Darre et al Diabetes Metab 2008*
- Meta analysis/Systematic review of 25 studies. SRP provided a small but significant improvement in glycemic control (mean 0.79% decrease).
- *Teeuw et al Diabetes Care 2010*
- Meta analysis/Systematic review. 5 articles met inclusion criteria. Perio tx leads to an improvement of glycemic control in Type 2s for at least 3 months.
- *Simpson. Cochran Library 2010*. Treating perio may lower blood sugar levels in type 2's. Limited evidence type 1's.

Diabetic Periodontal Treatment Program Phoenix Indian Medical Center

- Over 3,900 patients with diabetes enrolled since 1998.
- After periodontal treatment, the patients are placed on 3 to 9 month recalls



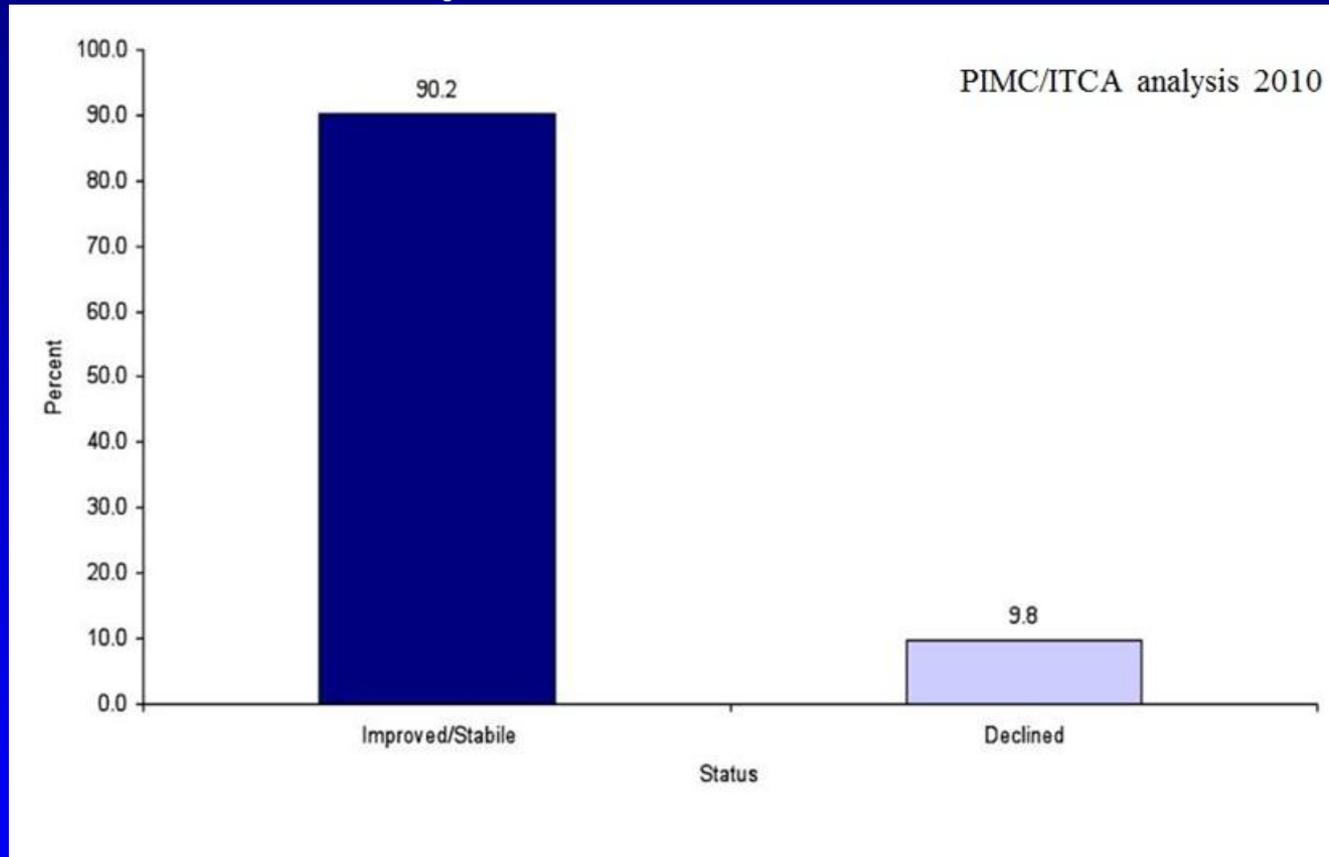
Diabetic Periodontal Treatment Program Phoenix Indian Medical Center

- Severity of disease:
- 68.2% with gingivitis to mild chronic perio
- 23.3% with moderate to severe chronic perio
- 5.8% with generalized severe perio/caries requiring full mouth extraction
- 2.7% already edentulous

IHS treatment protocol in dms with moderate to severe perio:

- Intensive OHI and motivation
- 1/2 mouth ultrasonic SRP with LA
 - Aggressive periodontal pocket debridement in deep pockets.
- Extract hopeless teeth
- Antibiotic
 - Doxy 100mg bid X 14 or 21 days
- Antimicrobial mouthrinse
- Analgesic
- Recall 3-6 months

Perio treatment was effective in improving perio health



Over 90% of the patients' improved or were stable at their first recall visit from their completion of care visit

The Elimination of Dental Infection and its Effect on Glycemic Control in Diabetic Patients with Periodontitis

- Type 2 diabetics with severe chronic periodontitis &/or caries received full mouth extractions prior to complete dentures.
- Glycated hemoglobins (HbA1c) were obtained by blood draw prior to extractions and 30-200 days post extraction.
- Of 87 patients at PIMC, 30 required at least 4 extractions and received timely HbA1c assays.
- Findings: The decrease in HbA1c was significant. Mean change was 1.07 percentage points. Median was 0.6 percentage points.

American Diabetes Association's 1st Symposium on Oral Health with representatives of the American Dental Association

- Periodontal disease is associated with insulin resistance and poor glycemic control
- Systemic inflammation appears to be the critical link between periodontitis and dm.

American Diabetes Asso Annual Scientific Session 2008

Medical Guideline on Oral Health for People with Diabetes

- Enquire about regular oral health check ups.
- Enquire at least annually for symptoms of gum disease, and to seek treatment if present.
- Remind that adequate daily oral home care is a normal part of diabetes self-management.
- Educate on the relationship between diabetes and gum disease.

International Diabetes Federation 2009



Periodontitis has an association with:

- Infective Endocarditis and prosthetic joints
- Diabetes
- Cardiovascular Disease
- Adverse Pregnancy Outcomes
- Pulmonary Disease
- Rheumatoid Arthritis
- Neurodegenerative diseases
- Pancreatic and Oral Cancer
- Chronic kidney disease

Generalized Moderate to Severe Periodontitis HbA1c = 11.3



6 months after deep cleaning and doxycycline



Initial Therapy- Diabetic Protocol-1997



3 Months Re-evaluation



2010: After 13 years of very infrequent care. Re-
tx SRP 2002 and 2008, 1 recall 2009. BS still in
the 200's. Gums healthier except upper ant.



Generalized Severe Chronic Periodontitis

28 year old with FBS 347.
Protocol treatment



Perio health improved 2 months post-protocol



Severe periodontal breakdown in a poorly controlled diabetic after no dental care for 2 years post protocol

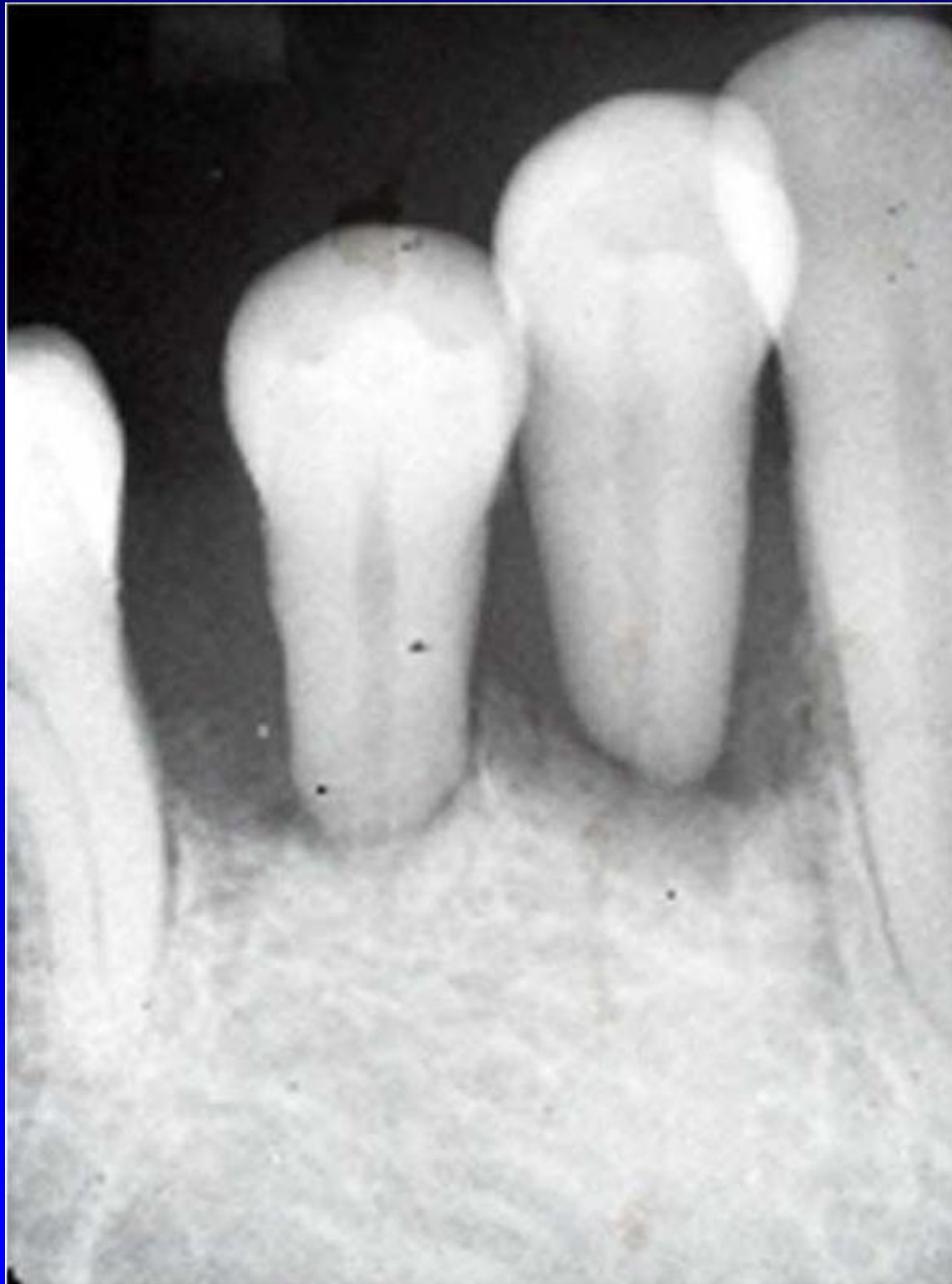


Faster recurrence of periodontitis can occur in poorly controlled Type 1 DMs on recall, in comparison to well controlled DM's and non-DM controls.

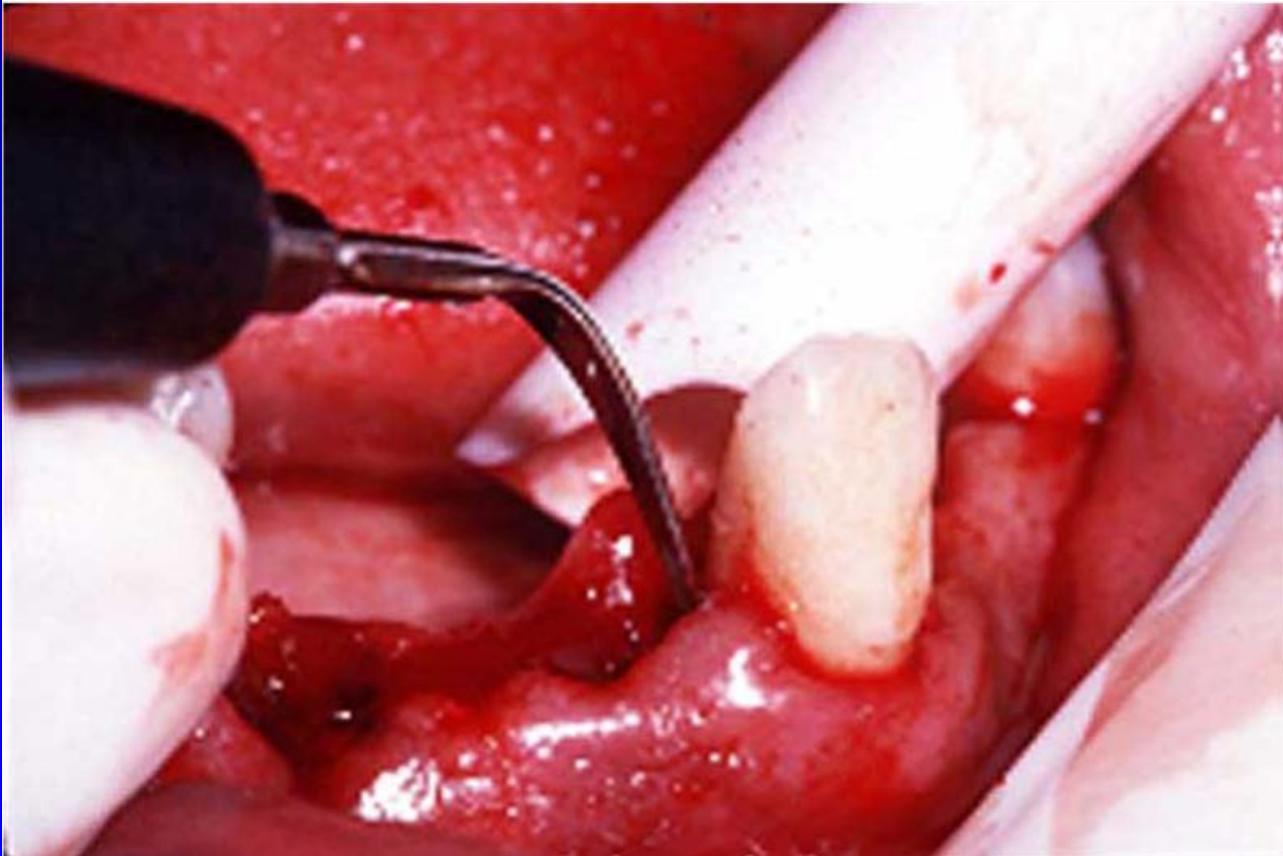
Tervonen JCP 1997

27 year old with severe periodontitis.
Select extractions and flap curettage

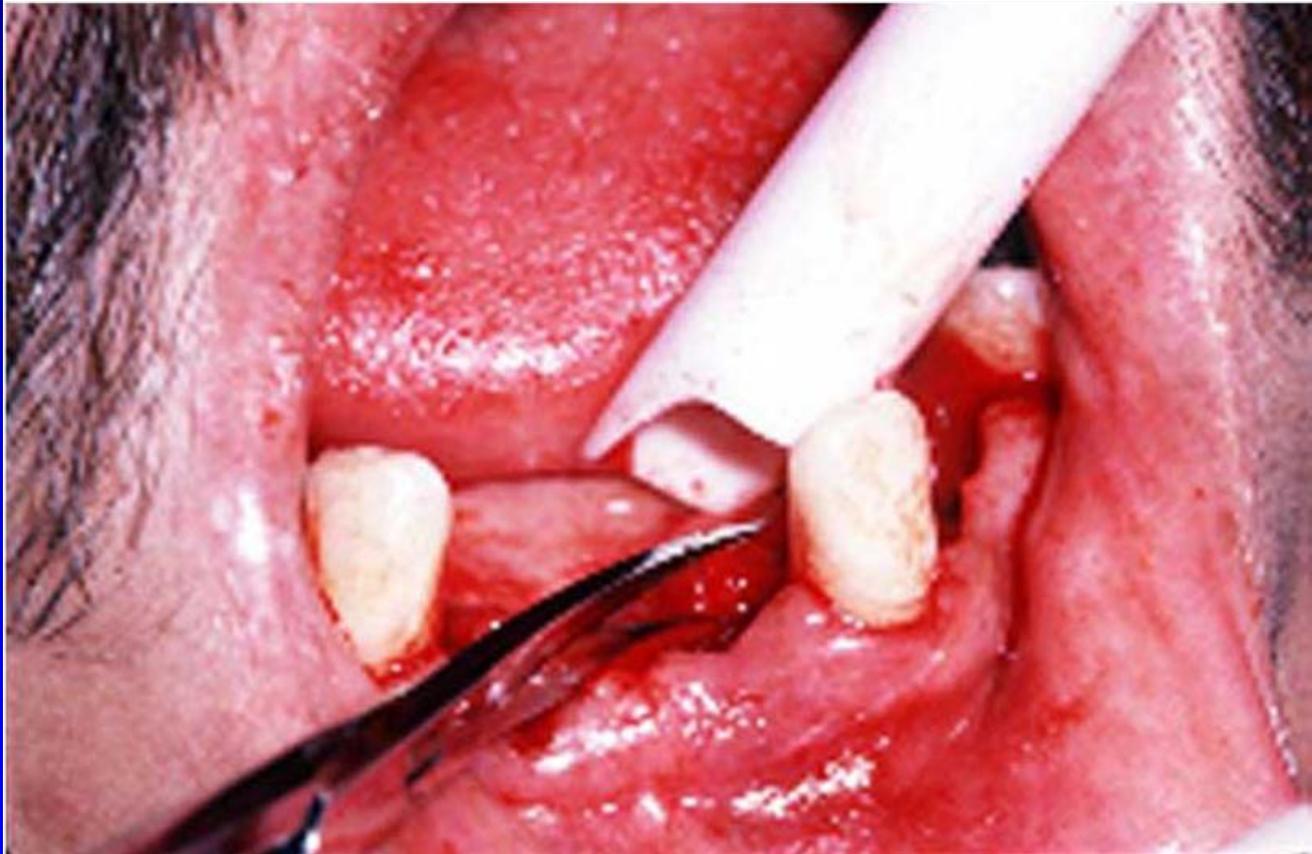




Flap curettage with extractions



Thinning/trimming granulation tissue



Sutured with apical positioning



3 months post healing-initial impressions

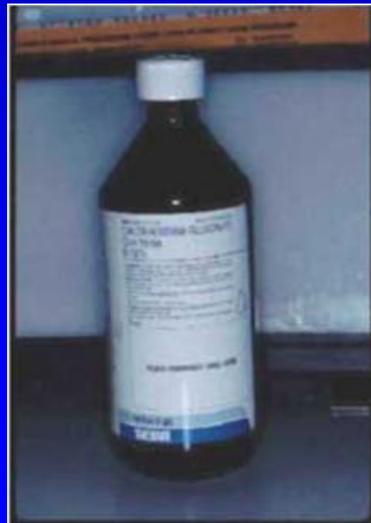
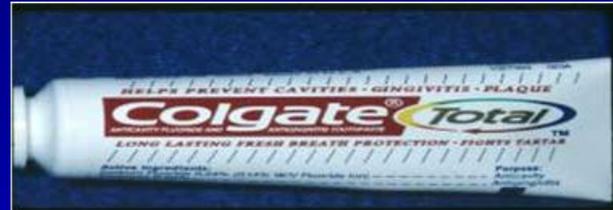


Scale the teeth and roots to remove bacteria and calculus, and use antimicrobials, decreasing inflammation and infection.

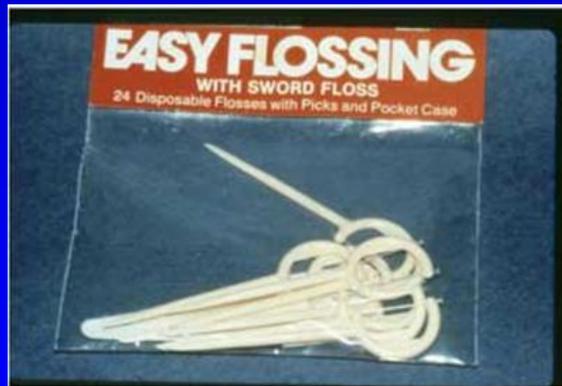


The use of powered toothbrushes, mouthrinses and toothpastes with antiseptic agents should be recommended

Ryan, 2007

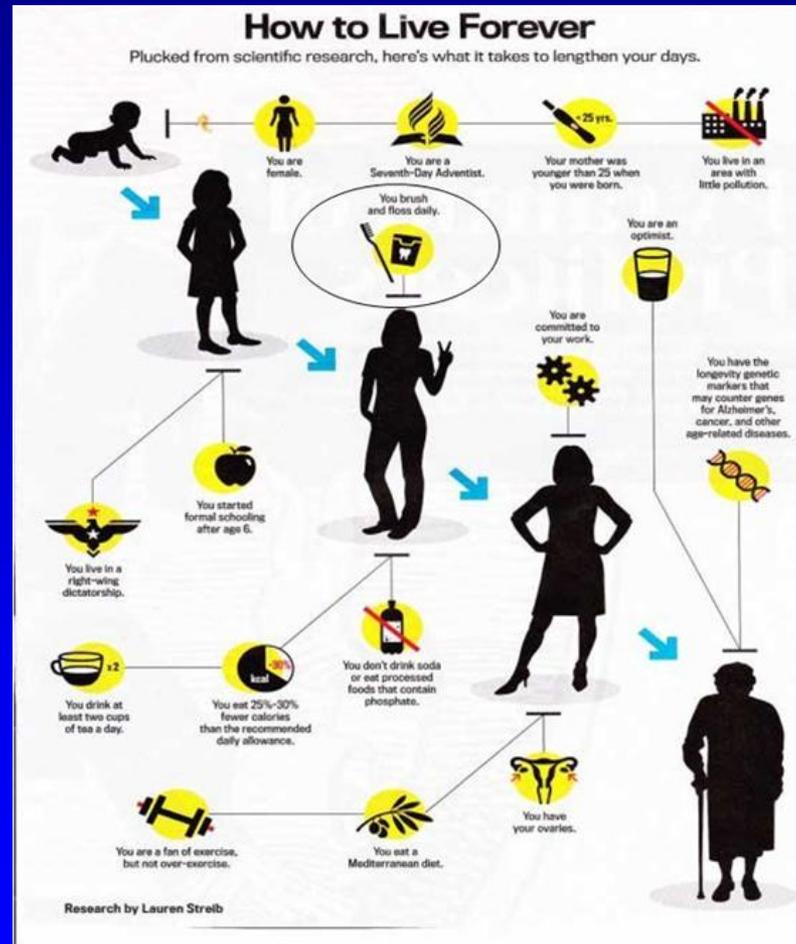


Home care is critical, particularly interproximal cleaning



From Newsweek

18 Apr 2011





Public Health and Periodontal Health



In an age of *increasing* health care costs, periodontal care can *decrease* costs.

Periodontal treatment can decrease medical costs for diabetes:

- 2 year study included 116,000 Aetna members with continuous medical and dental coverage.
- Finding: Early treatment of periodontitis (1st year) lowered total medical costs for members with DM, CAD, and stroke:
 - 16% reduction when CAD
 - 11% reduction when stroke/cerebrovascular d.
 - 9% reduction when DM

Albert, BMC Health Services Res, 2006

Periodontal treatment can decrease medical costs for diabetes:

- Blue Care Network (MI)- Medical costs for dms decreased 11%/month with 1 or 2 perio txs/yr vs no tx.

Taylor 2009, n= 2674

- BC/BS of MA -Dental care decreases medical costs \$144 per member per month. (\$238 if CAD).

- Regular dental cleanings reduced hospitalizations and ER visits for diabetes-specific medical care compared to those who didn't receive dental care.

Mosen JADA 2012

- Note: Annual medical costs for diabetics are estimated at \$11,744 per person vs \$2,560 for non-dms.

American Diabetes Asso 2008

Findings are leading to broader dental coverage

- Aetna now provides additional prophylaxes as well as full benefits for SRP, recalls, and local antimicrobials for patients with CVD and DM. 2007 “Dental/Medical Integration Program” also includes pregnant members.
- In 2006, CIGNA Dental expanded its Oral Health Integration Program, promoting treatment of gum disease for members with DM and CVD. Provides 100% reimbursement for out of pocket costs for SRPs and recalls. “Gum Disease Risk Assessment” online.
- BC/BS of MA provides 100% coverage of SRPs, and prophylaxes every 3 months, which don’t count towards the yearly maximum.
- Delta Dental of MI, OH, TN, MA, and IN doubled the number of prophys annually for many med comp pts.
- United Health Care has increased dental coverage.

The Dental Provider's Role:

- 50-60% of adults see the dentist at least once/year.
- 93.4% of people with periodontitis met American Diabetes Association guidelines for screening.
Strauss, JPHD 2010
- Screen for systemic disease:
 - BP, family hx dm, last MD visit, taking meds?
- Discuss lifestyle modifications: Touger-Decker, JADA 2010
- Smoking cessation, diet and weight loss, exercise
- Establish oral health! ZT4BG Kammer 2009



The Medical Provider's Role:

- Know the signs of perio disease and look in the mouth
- Ask the date of the last dental exam
- Encourage patients to practice good oral hygiene
- Develop a good working relationship with the patient's dentist.

Altenberg 2006



In Summary

- Chronic inflammation is the link between many illnesses, including diabetes and periodontitis.
- Periodontal treatment reduces the cumulative systems pathogen and inflammatory burden throughout the body. “The consequences of undertreatment could more than the loss of a few teeth.”

McGuire 2008

Questions?

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