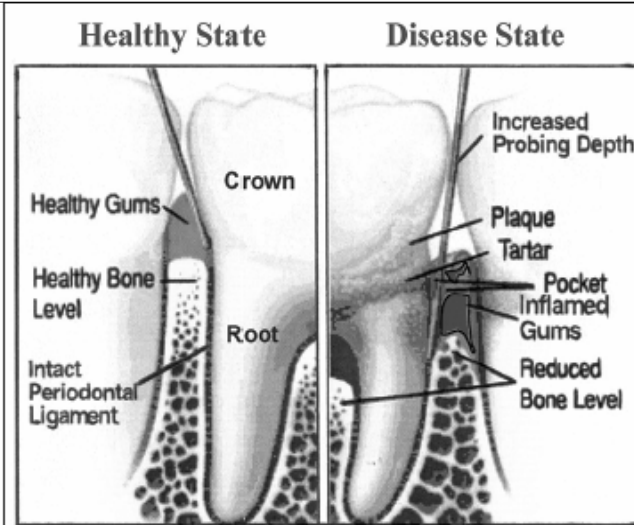


## Periodontal Disease and Pregnancy Outcomes

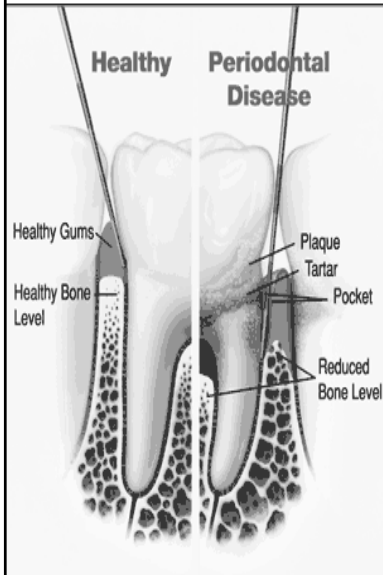
### State-of-the-Science

Xu Xiong, MD, DrPH  
Sotirios Vastardis, DDS, MS  
Pierre Buekens, MD, PhD

## Periodontal (Gum) Disease



## Periodontal (Gum) Disease



- Periodontal disease is a chronic, Gram-negative bacterial infection.
- Periodontal disease includes gingivitis and periodontitis, which affect the gums and bone supporting the teeth.
- Periodontitis is a serious infection that, left untreated, can lead to tooth loss.

## Periodontal (Gum) Disease



Healthy Gingiva

Gingivitis

Periodontitis

## **Prevalence of Periodontal Diseases**

“Periodontal diseases are highly prevalent and can affect up to 90% of the world population.”

Pihlstrom BL et al

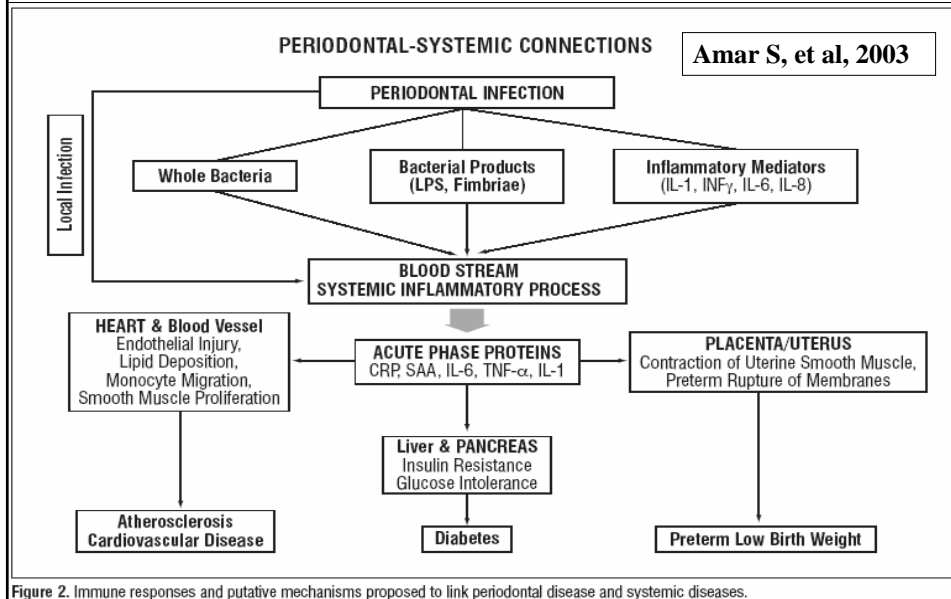
Lancet 2005;366:1809-20

## **Periodontal Disease & Systemic Health**

Periodontal disease may be associated with an increased risk of a variety of systemic diseases:

- CVD: arteriosclerosis, myocardial infarction, stroke;
- Diabetes: type 1 and 2;
- Adverse pregnancy outcomes ?

# Periodontal Disease & Systemic Health

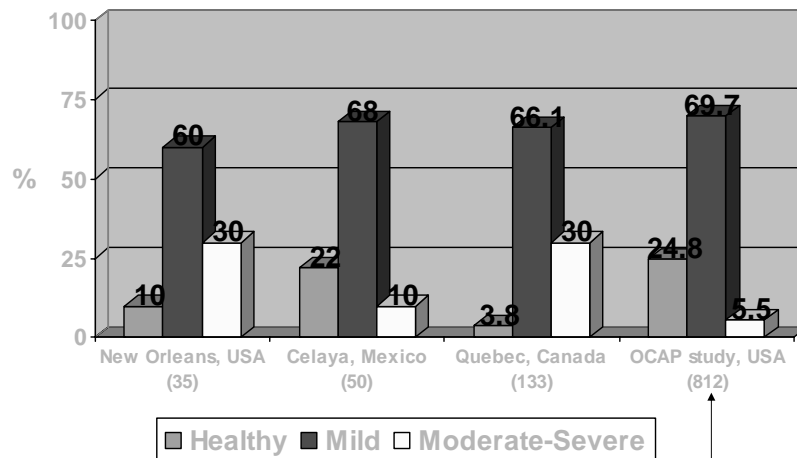


## Periodontal Disease and Pregnancy Outcomes?



- Preterm birth
- Low birth weight
- Miscarriage/stillbirth
- Intrauterine growth restriction
- Pre-eclampsia
- Gestational diabetes mellitus

## Prevalence of Periodontitis among Pregnant Women



Offenbacher S et al. Ann Periodontol 2001;6:164-74

## Public Health Importance

- Periodontal disease is highly prevalent in pregnant women
- No cure and prevention for these adverse pregnancy outcomes
- Periodontal disease is preventable and curable
- Treating pregnant women for periodontal disease for preventing adverse pregnancy outcomes?

## Questions?

- Is periodontal disease a risk factor for adverse pregnancy outcomes?
- Is the current evidence sufficient to make a policy change for recommending treatment of periodontal disease during pregnancy?

## Methods: Systematic Review

### Periodontal disease and adverse pregnancy outcomes: a systematic review

X Xiong,<sup>a</sup> P Buekens,<sup>a</sup> WD Fraser,<sup>b</sup> J Beck,<sup>c</sup> S Offenbacher<sup>d</sup> **BJOG 2006;113 (2):135-143**

<sup>a</sup>Department of Epidemiology, School of Public Health and Tropical Medicine, Tulane University, New Orleans, Louisiana, USA <sup>b</sup>Department of Obstetrics and Gynecology, University of Montreal, Montreal, Canada <sup>c</sup>Department of Dental Ecology <sup>d</sup>Department of Periodontics, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

This review is built upon the findings of a previously published systematic review article, including 19 new studies published from March 2005 to date

## **Methods: Systematic Review**

- Literature search
- Study selection
- Data extraction
- Quality assessment
- Statistical pooling

## **Literature search**

- *Studies published in full text:* identified by searching computerized databases (MEDLINE, EMBASE, CINAHL, Current Contents) from 1966 to date

## Literature search

- Search terms:
  - *periodontal disease (s), gingivitis, or periodontitis*
  - *gestational age, birth weight, preterm birth or delivery, premature birth or delivery, low birth weight, pregnancy, pregnancy loss, fetal growth restriction, small-for-gestational age, miscarriage, abortion, pre-eclampsia or eclampsia, hypertension, or pregnancy-induced hypertension, gestational diabetes, or gestational diabetes mellitus*

## Study selection

- Study inclusion criteria:
  1. The study was primarily a comparative study in pregnant women;
  2. Periodontal disease was defined by various *clinical* periodontal indices and was an exposure;
  3. Outcomes: preterm birth, low birth weight, gestational age, small-for-gestational age, birth weight, pregnancy loss or miscarriage, preeclampsia, gestational diabetes mellitus.

## **Data extraction**

- We used a form designed a priori to extract the information from the selected studies;
- We extracted odds ratios (OR) and risk ratios (RR) from the selected studies, along with other study characteristics (e.g., sample size, definitions of periodontal disease, information on confounders being controlled) and study conclusion (s).

## **Study quality assessment**

- We did not assess the quality of the selected studies because of the differences in the definitions of periodontal disease and adverse pregnancy outcomes, as well as other potential biases among the studies.

## **Statistical pooling (meta-analysis)**

- For the observational studies:
  - Due to the high level of heterogeneity in periodontal disease and adverse pregnancy outcome definitions across studies, it was not appropriate to apply statistical methods to estimate overall pooled risks of periodontal disease.
  - We used “vote-counting” method in this review.

## **Statistical pooling (meta-analysis)**

- For clinical trials:
  - We calculated pooled RR by weighting each study using the inverse of the variance of the RR's natural logarithm.
  - The variance was computed for each study from 95% RR confidence intervals; unreported confidence intervals were computed from distribution data.

## Results

- 44 studies (1966 to date):

1 <sup>st</sup> Review (BJOG 2006)	1966 – 03/2005	25 studies
2 <sup>nd</sup> Review	03/2005 – 11/2006	19 studies

## Results

- 44 studies (1966 to date):
  - 26 case-control (including cross-sectional) studies
  - 13 cohort studies
  - 5 controlled trials (one not randomized)

## Results

- 44 studies (1966 to date):
  - 23 countries—13 USA, 4 UK, 3 Brazil, 2 Chile, 2 Canada, 2 Hungary, 2 Turkey and 1 each from Argentina, Austria, Brazil, Colombia, Croatia, Denmark, Germany, Iceland, Iran, Israel, Saudi Arabia, Senegal, Spain, Sri Lanka, Thailand, and Venezuela

## Results

- 44 studies (1966 to date):
  - 29 studies: **IS** a risk factor
    - \_\_ from the USA and developing countries, or populations that were predominantly African-American or of low socio-economic status or at higher risk of developing adverse pregnancy outcomes
  - 15 studies: **IS NOT** a risk factor
    - \_\_from the UK, Canada, Iceland, Denmark, Spain, Germany, Turkey, Sri Lanka, Brazil, Argentina, USA

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Preterm low birth weight	6	3.5-7.5	4	0.78-1.9

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Preterm birth	12	2.1-20.0	11	1.06-1.5

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Low birth weight	10	1.1-7.2	5	1.05-

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Preeclampsia	4	2.4-3.47	1	0.99-

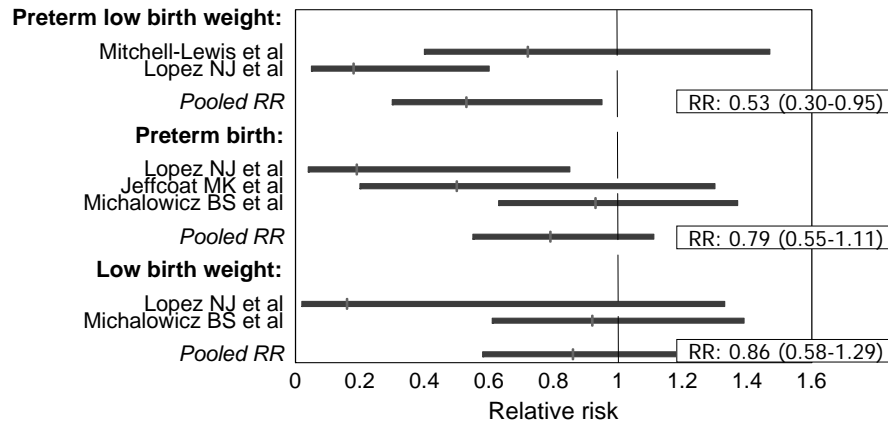
<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Miscarriage or stillbirth	2	2.54-3.84		

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Intrauterine growth restriction	1	2.3-	1	1.04-

<b>Results</b>				
Pregnancy Outcome	Studies show 'positive' effect		Studies show 'no' effect	
	No.	OR/RR	No.	OR/RR
Gestational diabetes	1	9.11-		

<b>5 clinical trials</b>		
Authors, Year, Country	Sample size (Interventions/controls)	Outcomes
Mitchell-Lewis et al, 2001, USA	74/90 (non-randomized)	Preterm LBW
Lopez NJ et al, 2002, Chile	200/200 (low SES women)	Preterm LBW, PTB, LBW
Jeffcoat MK et al, 2003, USA	123/123/120 (85% black women)	PTB
Sadatmansouri S et al, 2006, Iran	15/15	Preterm LBW
Michalowicz BS et al, 2006, USA	413/410	PTB, LBW, SGA

## Periodontal disease and birth outcomes: A meta-analysis of clinical trials



## 3 ongoing clinical trials

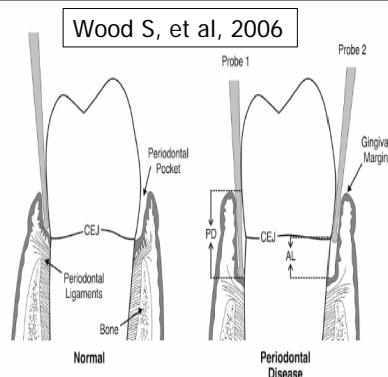
Source: ClinicalTrials.gov

PIs, Country	Sample size	Date start & completion
Steven Offenbacher USA	1800	02/2004 — 08/2007
Marjorie Jeffcoat George Macones USA	2100	10/2004 — 05/2008
John P Newnham Australia	1094	03/2005 — 10/2008

## Potential biases

- Periodontal disease definition:
  - Great variation in periodontal disease definitions among studies.
  - No universally accepted standard for periodontal disease diagnosis.

## Measures of periodontal diseases



Probe 1 (left) is measuring probing depth (PD), the distance from Gingival Margin to base of Periodontal Pocket, probe 2 (right) is measuring distance from Gingival Margin to Cementum Enamel Junction (CEJ). Attachment Loss (AL) = probe 1 - probe 2.

### Clinical periodontal indicators:

#### Probing depth (PD)

(Distance from the gingival margin to the base of the pocket)

#### Clinical attachment loss (CAL)

(Distance between the cemento-enamel junction (CEJ) and the base of the clinical pocket)

#### Bleeding on probing (BOP)

#### Gingival recession

## Potential biases

- Periodontal disease definition:
  - We failed to find the same definition used in two or more studies, even by the same author (s) in different studies.
  - Very few authors attempted to justify their criteria.
  - Selecting different criteria to define periodontal disease will lead to different results.

(Reason: do not do meta-analysis for the observational studies/study quality assessment)

## Potential biases

- Confounding factors:
  - 27 of the 40 studies we reviewed (not including the four randomized controlled trials) controlled for some confounding variables.
  - The confounding variables that were included for adjustment vary greatly among studies.
  - Key confounding variables: smoking, SES, race, history of adverse pregnancy outcomes, infection (e.g., bacterial vaginosis and chorioamnionitis), antibiotic use during pregnancies, etc.

## Potential biases

- Study sample size:
  - Many of the studies had small study sample size: e.g., 13 studies had less than 100 patients:
    - Increasing the potential for associations observed by chance (random error).
    - Lack of statistical power.

## Implications for Future Research

1. Need for development of more universally accepted:
  - Research definition of periodontal disease
  - Severity criteria for periodontal disease

## Implications for Future Research

2. Analyze clinical periodontal measures (such as PD and CAL) in more objective approaches:
  - e.g. , Analyze PD or CAL as continuous variables in association with adverse pregnancy outcomes (e.g., correlation analysis, linear regression)

## Implications for Future Research

3. Minimize the effects of potential biases:
  - Sample size (needs to be sufficiently large)
  - Confounding variables:
    - Race/ethnicity
    - Socioeconomic status
    - Smoking.

## Implications for Future Research

4. Pool *original data* from different studies (as opposed to meta-analysis by pooling ORs and RRs), allowing for:
  - Use of the same definitions for periodontal disease and adverse pregnancy outcomes.
  - Sufficient sample sizes.
  - Examine if the effect of periodontal disease on adverse pregnancy outcomes are different according to different regions and populations (e.g., ethnic, socioeconomic and maternal smoking status).

## Implications for Clinical Practice

- Periodontal health is a component of general health.
- Prevention and treatment of periodontal diseases are important to maintain health.
- Women who are pregnant or planning pregnancy are encouraged to undergo periodontal examinations.
- For pregnant women, proper periodontal examination and treatment, if indicated, may have a beneficial effect on the health of their babies.

*American Academy of Periodontology (AAP) Statement  
Regarding Periodontal Management of the Pregnant Patient  
J. Periodontol. 2004;75: 495*

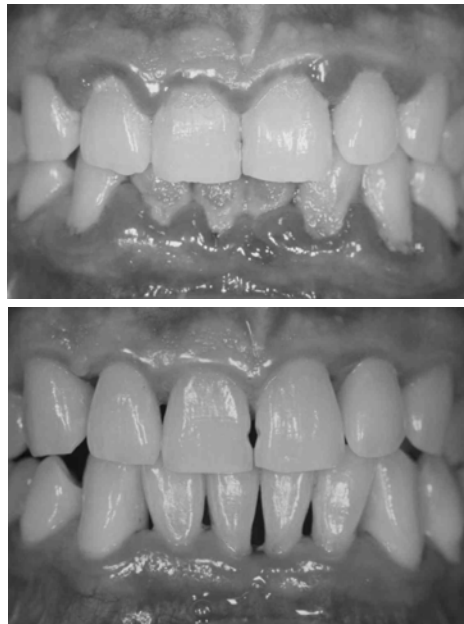
## Initial Periodontal Therapy

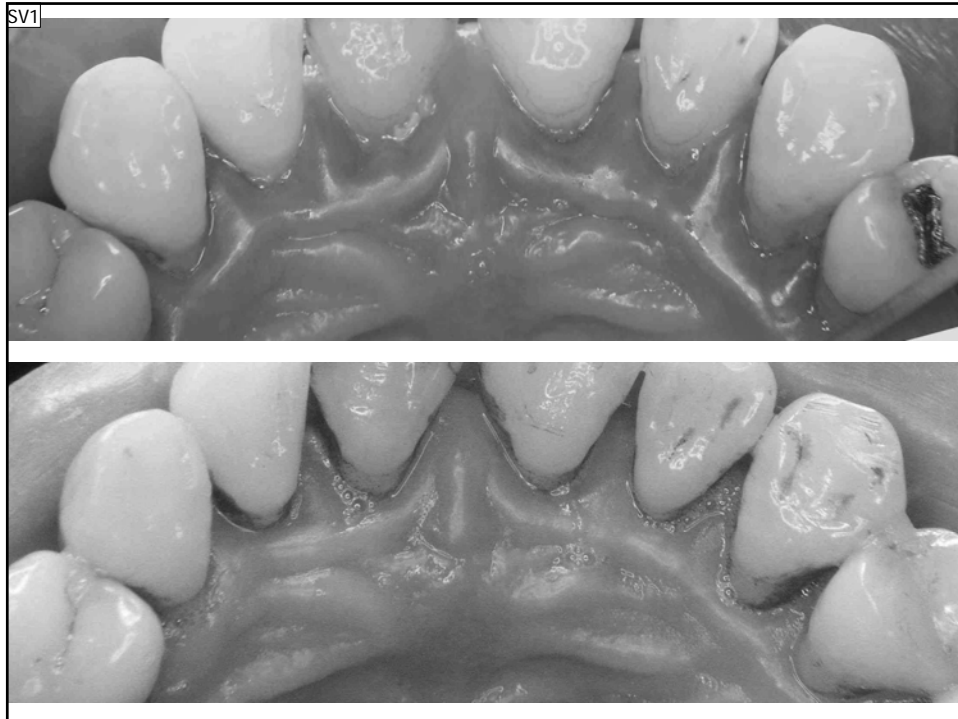
1. Elimination, alteration, or control of systemic risk factors which may contribute to periodontitis  
(diabetes, smoking, stress, nutrition, substance abuse, and medications).
2. Instruction, reinforcement, and evaluation of the patient's plaque control
3. Supra- and subgingival scaling and root planing to remove microbial plaque and calculus.
4. Antimicrobial agents or devices may be used as adjuncts.

American Academy of Periodontology (AAP) Parameter on Chronic Periodontitis With Slight to Moderate Loss of Periodontal Support  
*J Periodontol* 2000;71:853-855.

## Initial Periodontal Therapy

1. Supra- and subgingival scaling and root planing to remove microbial plaque and calculus is safe, cost-effective and evidence-based treatment
2. Results in significant reduction of local inflammation, Probing Depth (PD) and of systemic inflammatory mediators
3. Can be performed by Dental Hygienists and General Dentists following local anesthesia





## Implications for Policy Making

- Public health policies should support comprehensive dental services for pregnant women so that their own oral and general health, as well as their children's health are safeguarded.
- Non-surgical periodontal procedures are safe and more economical compared to surgical interventions, so they should be the treatment of choice for pregnant patients with periodontal inflammation.

**Slide 47**

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**SV1** conservative periodontal treatment in a young woman with severe periodontal disease (before and after)

Sotirios Vastardis, 9/11/2006

## **Conclusions**

1. There is evidence of an association between periodontal disease and increased risk of several adverse pregnancy outcomes (e.g., preterm birth and low birth weight), especially in economically disadvantaged populations.

## **Conclusions**

2. There is insufficient evidence to support the provision of periodontal treatment in pregnancy for the purpose of reducing adverse pregnancy outcomes.

## Conclusions

3. Several randomized controlled trials are underway to test the hypothesis that periodontal treatment can reduce rates of certain adverse pregnancy outcomes.

Findings from these trials (or through a meta-analysis) would provide a more definitive conclusion.

## Conclusions

4. More studies are needed to examine possible associations between periodontal disease and maternal complications (gestational diabetes and pre-eclampsia), miscarriage, stillbirth, and very preterm birth.