

# Understanding The Role Of The Oral Microbiome In The Mouth-Body Connection

Dr. Gerry Curatola  
October 2017



# Oral Health: The “800 lb Gorilla” In The Wellness Room

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# The Mouth-Body Connection



# The Mouth-Body Connection

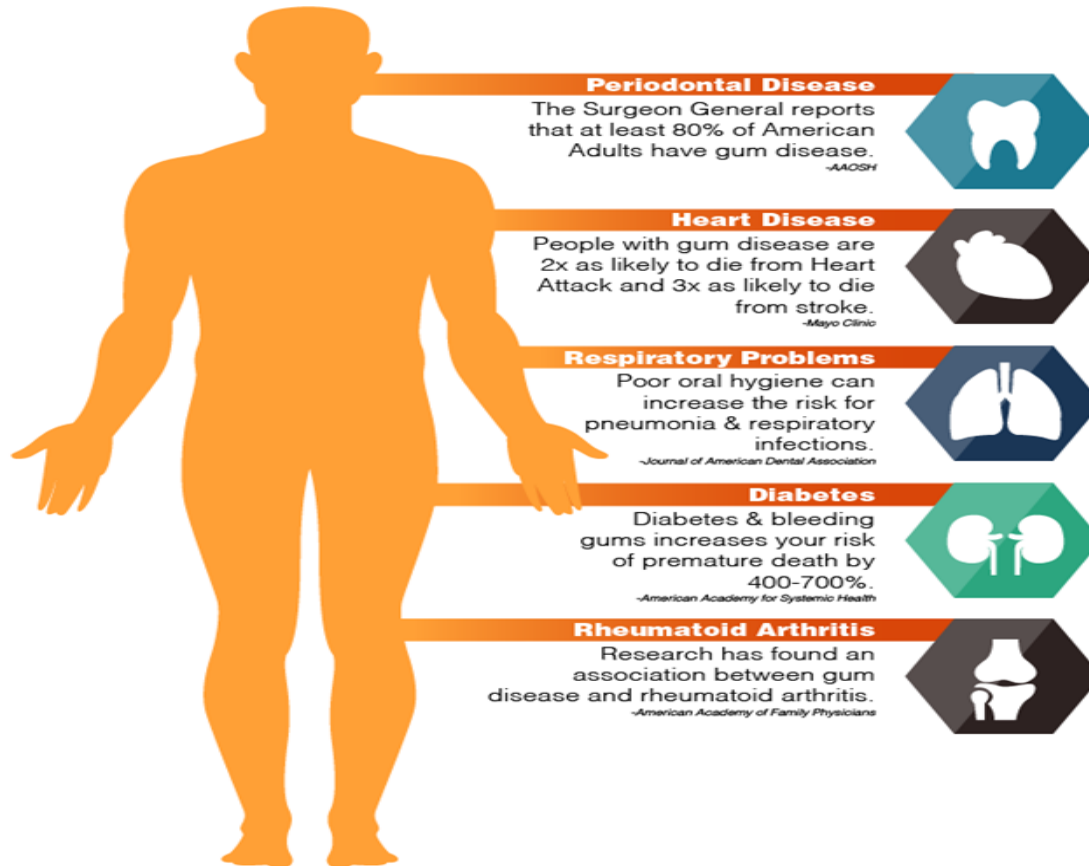
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# The Mouth-Body Connection

## MOUTH BODY Connection



# The Mouth As “Mirror” To The Body

SYSTEMIC CONDITION/DISEASE	ORAL SYMPTOMS/MANIFESTATIONS
• HIV/AIDS	• <i>OFTEN MANIFESTS AS FUNGI IN THE MOUTH</i>
• LOW BLOOD SUGAR	• <i>PRODUCES CHARACTERISTIC ODOR IN THE MOUTH</i>
• TUBERCULOSIS	• <i>CHARACTERISTIC ULCER ON TONGUE/ORAL TISSUES</i>
• XEROSTOMIA (DRY MOUTH)	• <i>RESULTS IN FORMATION OF RAPID DENTAL DECAY</i>
• TETANUS	• <i>INJECTION THAT MAY RESULT IN LOCKJAW</i>
• DIABETES	• <i>DELAYED WOUND HEALING/ADVANCED GUM DISEASE</i>
• LEUKAEMIA	• <i>CAN RESULT IN THE FORMATION OF ORAL ULCERS</i>
• SYPHILIS	• <i>TOOTH/PALATE MALFORMATION FOR CHILD IF PREGNANT</i>
• STRESS/PSYCHOLOGICAL DISORDERS	• <i>GRINDING, CLENCHING, AND TMJ JOINT PROBLEMS</i>
• DOWN SYNDROME	• <i>OFTEN INCLUDES AN ENLARGED TONGUE</i>
• DRUG ABUSE	• <i>ASSOCIATED WITH SEVERE CARIES AND TOOTH LOSS</i>
• BULIMIA	• <i>OFTEN CAUSES CHARACTERISTIC TOOTH EROSIONS</i>
• VARIOUS GENETIC SYNDROMES	• <i>CAUSES MALFORMATION OF THE TEETH AND JAWS</i>

# The Mouth As “Mirror” To The Body

## SECRETS YOUR TONGUE REVEALS About Your HEALTH



### FISSURES

Tongue fissures are a common symptom in 6 to 20 % of patients with psoriasis skin disorder.



### WHITE CREAMY LAYER/PATCHES

A white, cottage cheese-like coating on the tongue, is one of the most common symptoms of “oral candidiasis” (OC) – a yeast infection of the mouth.



Top10

### ABNORMAL SMOOTHNESS

Abnormal Smoothness of the tongue is known as atrophic glossitis (AG).



### BRIGHT REDNESS

A bright red tongue could be a symptom of a Vitamin B12 deficiency.

Top10



### THICK YELLOW COATING

A thick yellow coating on the tongue might just be indicative of excess bacterial activity.



### BLACK AND HAIRY

A black and hairy tongue might be caused by excessive smoking and poor oral hygiene.



Top10

### PAINLESS BUMP(S)

A painless bump that appears on the side of the tongue & goes away in 2 weeks or less is not a cause for alarm. However, if it persists longer then it could be an early sign of oral cancer.



### SORES

Tongue sores usually result from eating something sharp or from accidentally biting your tongue. However, they may also signify stress, anxiety or a hormonal imbalance.

To explore more, visit [www.Top10HomeRemedies.com](http://www.Top10HomeRemedies.com)



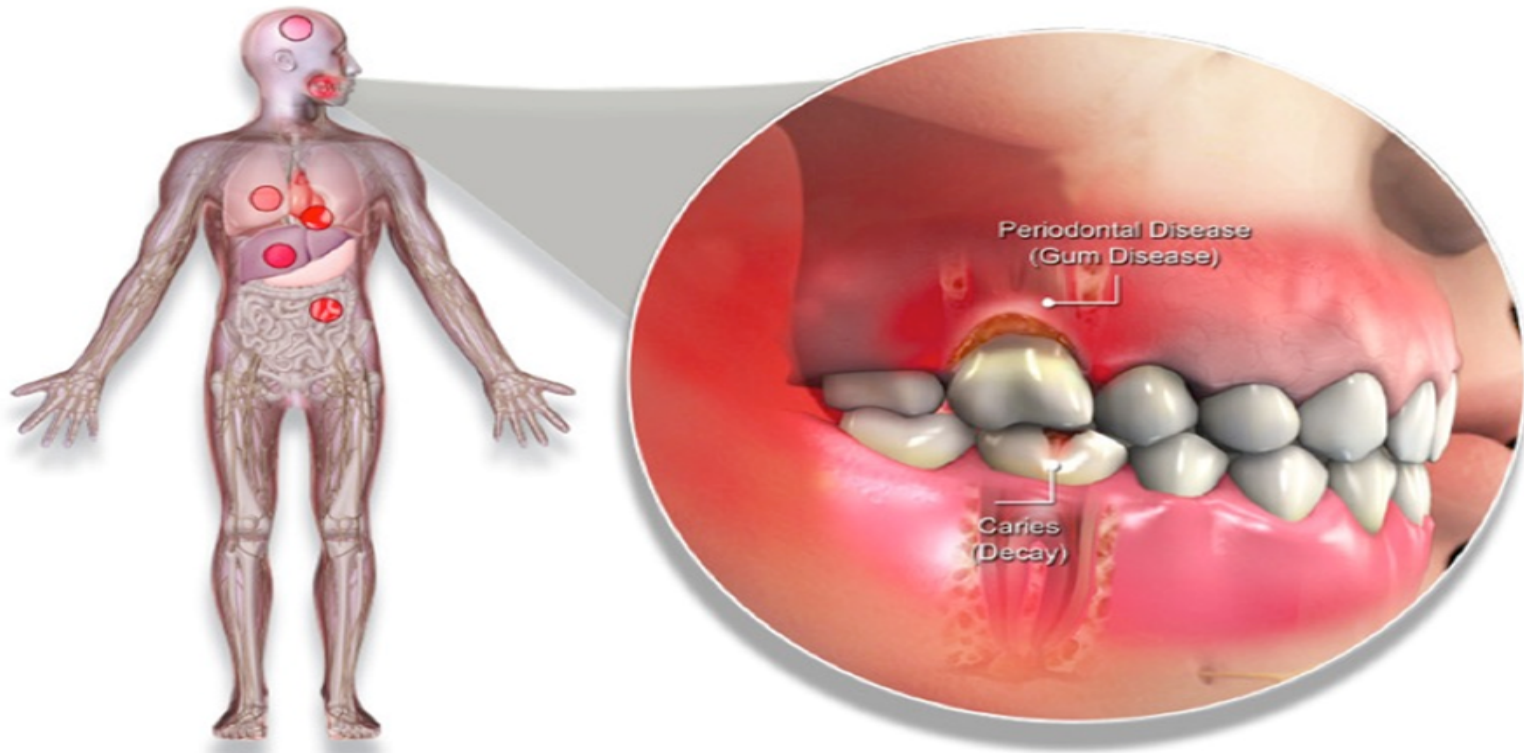
# The Mouth As "Mirror" To The Body

## Tooth / Organ Relationship Chart

Glands	Anterior pituitary	RIGHT BREAST			Posterior pituitary	Intermediate lobe of pituitary	Pineal	Pineal	Intermediate lobe of pituitary	Posterior pituitary	LEFT BREAST			Anterior pituitary		
		Parathyroid	Thyroid	Thymus							Thymus	Thyroid	Parathyroid			
<b>Organs</b>	Heart Small Intestine Endocrine gland, Pericardial	Breast Thyroid Stomach Pancreas	Lungs Large Intestine	Liver Gall Bladder Eye	Kidneys Prostate Bladder, Uterus, Rectum, Anus	Liver Gall Bladder Eye	Lungs Large Intestine	Esophagus Breast Thyroid Stomach Spleen	Heart Small Intestine Endocrine gland, Pericardial							
<b>Teeth</b>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<b>Upper Jaw</b>	3 <sup>rd</sup> Molar (wisdom)	2 <sup>nd</sup> Molar	1 <sup>st</sup> Molar	2 <sup>nd</sup> Bicuspid (pre-molar)	1 <sup>st</sup> Bicuspid (pre-molar)	Canine (cuspid)	lateral incisor	Central incisor	Central incisor	lateral incisor	Canine (cuspid)	1 <sup>st</sup> Bicuspid (pre-molar)	2 <sup>nd</sup> Bicuspid (pre-molar)	1 <sup>st</sup> Molar	2 <sup>nd</sup> Molar	3 <sup>rd</sup> Molar (wisdom)
<b>Lower Jaw</b>	3 <sup>rd</sup> Molar (wisdom)	2 <sup>nd</sup> Molar	1 <sup>st</sup> Molar	2 <sup>nd</sup> Bicuspid (pre-molar)	1 <sup>st</sup> Bicuspid (pre-molar)	Canine (cuspid)	lateral incisor	Central incisor	Central incisor	lateral incisor	Canine (cuspid)	1 <sup>st</sup> Bicuspid (pre-molar)	2 <sup>nd</sup> Bicuspid (pre-molar)	1 <sup>st</sup> Molar	2 <sup>nd</sup> Molar	3 <sup>rd</sup> Molar (wisdom)
<b>Teeth</b>	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
<b>Organs</b>	Heart Small Intestine Endocrine gland, Pericardial	Lungs Large Intestine	Stomach Pancreas	Liver Gall Bladder Eye	Kidneys Prostate Bladder, Uterus, Rectum, Anus	Liver Gall Bladder Eye	Stomach Spleen	Lungs Large Intestine	Heart Small Intestine Endocrine gland, Pericardial							
<b>Glands</b>				Ovaries	Testicles	Adrenals	Adrenals	Ovaries	Testicles							
<b>Element</b>	Fire	Earth			Metal	Wood	Water	Water	Wood	Metal	Earth			Fire		



# The Mouth As “Gateway” To The Body



# The Mouth As “Gateway” To The Body

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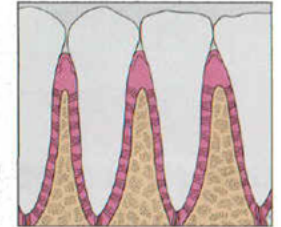
<b>MEDICAL CONDITION</b>	<b>INCREASED RISK</b>
Stroke	300%
Heart disease	72-168%
Fatal coronary heart disease	50%
Preterm birth	700%
Oral cancer	400%
Diabetes	Increased risk
Arthritis	Increased risk
Pneumonia aspiration	Increased risk

# The Epidemic Problem of Periodontal (Gum) Disease

- 85% of Adults Over 35 Have Some Form of Gum Disease.
- The Link Between Gum Disease To Systemic Illness is Well Established.
- Past Approaches (i.e., Antibiotics and Antimicrobials) Have Been Shown to Be Both Ineffectual and Harmful.

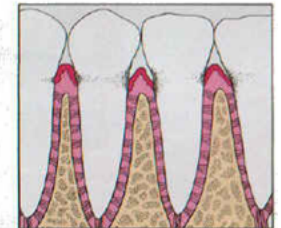
## 1. Normal, Healthy Gingiva (Gums)

Healthy gums and bone anchor teeth firmly in place.



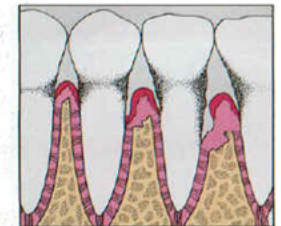
## 2. Gingivitis

Plaque and its byproducts irritate the gums, making them tender, inflamed, and likely to bleed.



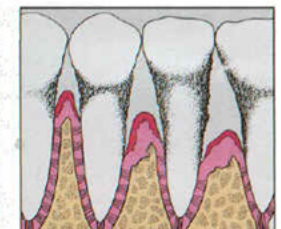
## 3. Periodontitis

Unremoved, plaque hardens into calculus (tartar). As plaque and calculus continue to build up, the gums begin to recede (pull away) from the teeth, and pockets form between the teeth and gums.

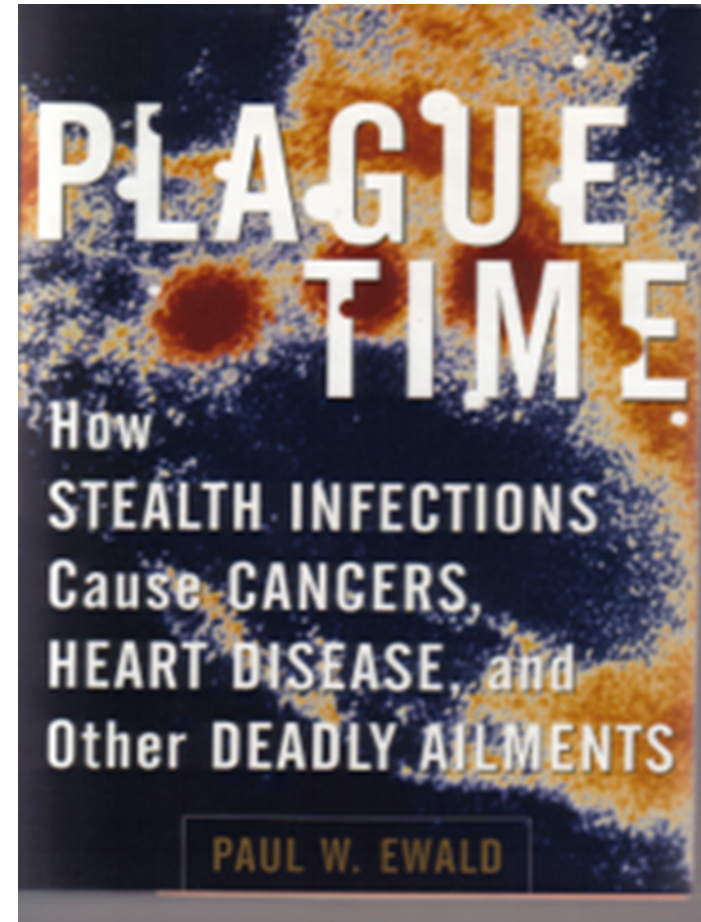


## 4. Advanced Periodontitis

The gums recede farther, destroying more bone and the periodontal ligament. Teeth—even healthy teeth—may become loose and need to be extracted.



# Oral Disease: A Major Source of Chronic Low-Grade Inflammation



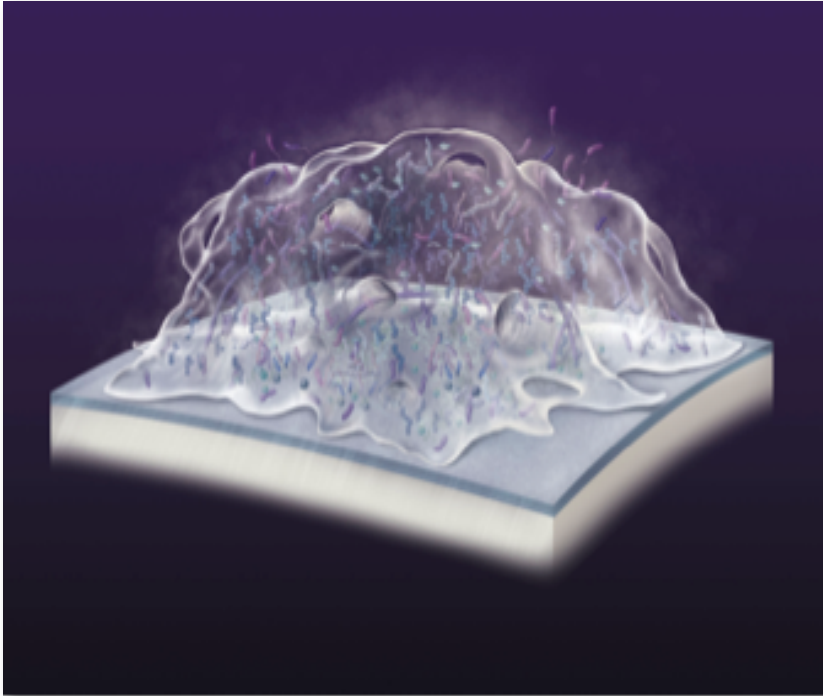


## Possible mechanisms and pathways:

1. Direct effects of oral infectious pathogens
2. Inflammatory response to oral pathogens.
3. The inflammatory effects on vascular integrity.
4. The effects on gene polymorphisms to a more pro-inflammatory genotype. (IL-genes)

# THE ORAL MICROBIOME

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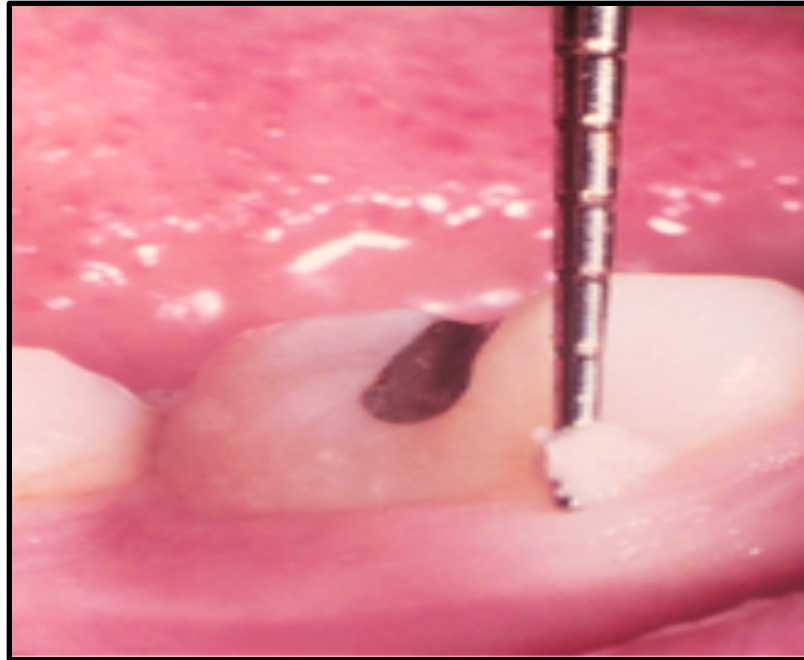


- Essential for life.
- Essential for protection against harmful environmental pathogens.
- Essential component of mammalian digestion pathways.
- Essential component of salivary immune system regulation

The oral microbiome is made up of water, salivary proteins, crevicular fluid, immune complexes, minerals, and vast numbers of microorganisms, approximately 700 species and anywhere from 6 to 10 billion in number.

# THE ORAL MICROBIOME

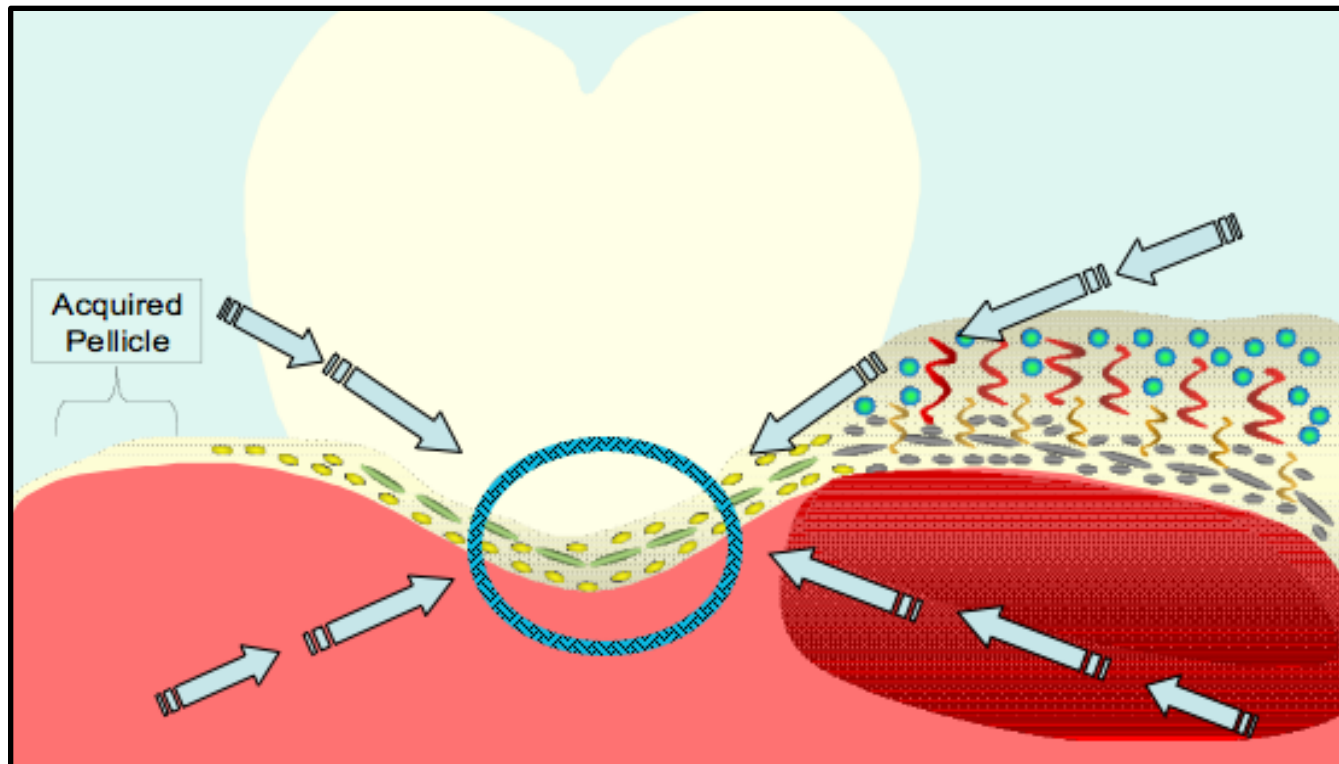
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Emerging human microbiome science has identified our oral ecosystem, the oral microbiome (or oral biofilm), as an **intelligent semi-permeable membrane**

# THE ORAL MICROBIOME

Homeostasis (balance) is the center of health.





# THE ORAL MICROBIOME

Homeostasis (balance) is the center of health.

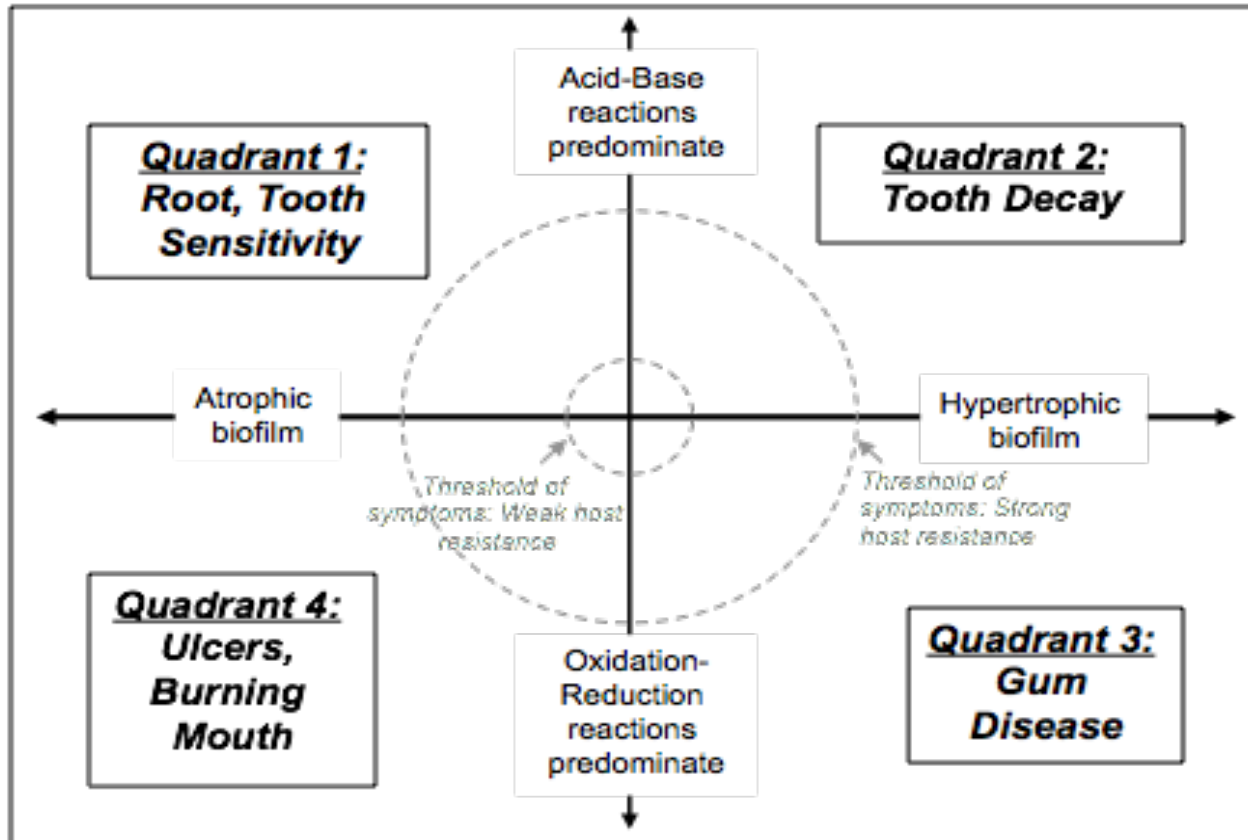
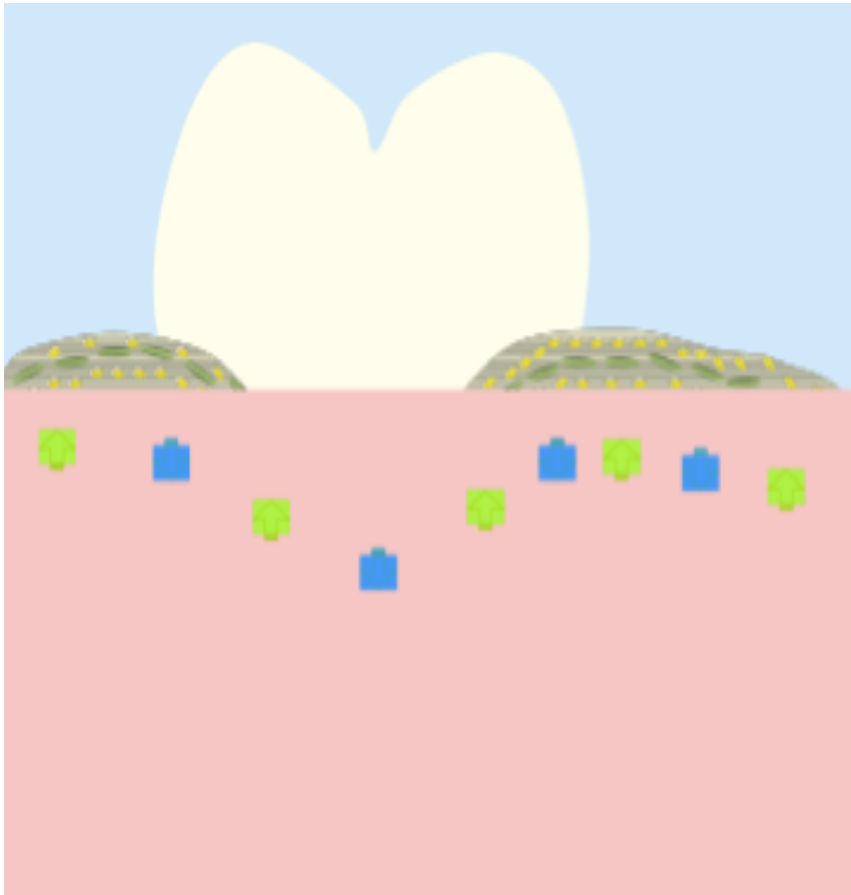


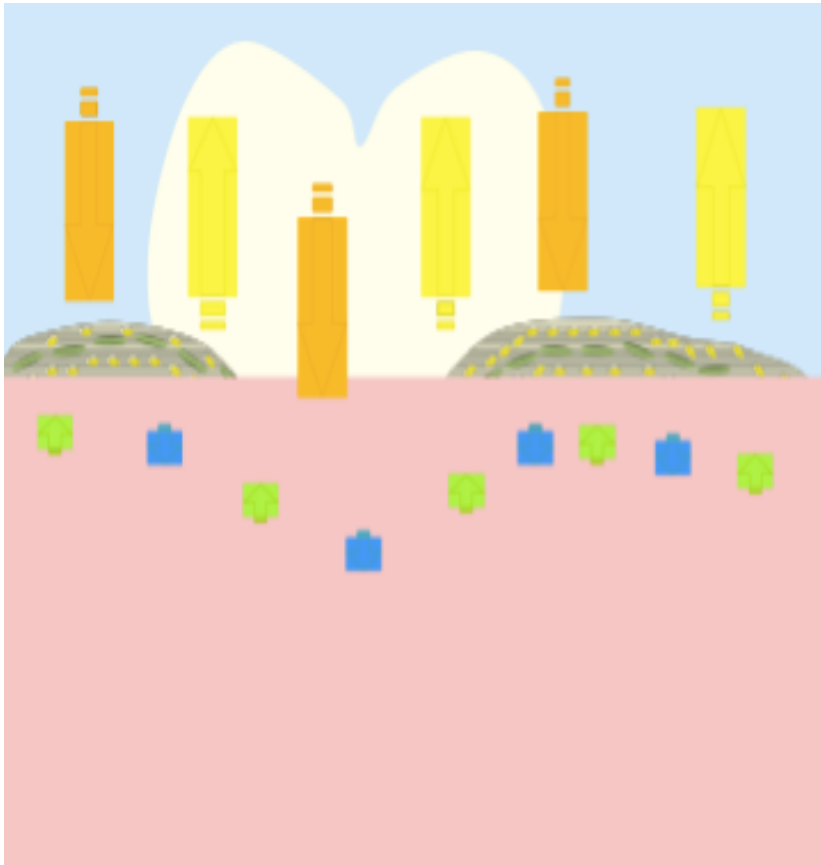
Figure 1

# THE ORAL MICROBIOME



- The oral microbiome also exchanges with the structures on which it sits and these exchanges are dependent on the condition of this ecosystem.
- It can be a storehouse of the minerals and ions that keep enamel hard and the pH neutral. Or, if the organisms in the biofilm demand free calcium or phosphate, they may create a deficit of these minerals and ions resulting in a low pH and demineralization.

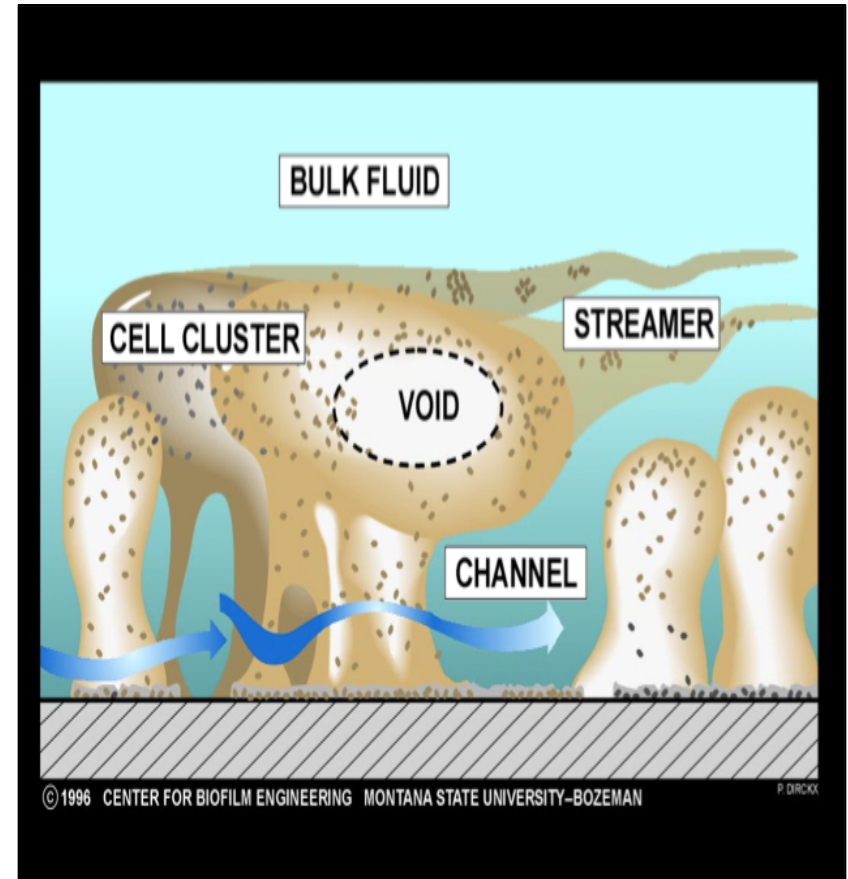
# THE ORAL MICROBIOME



- The oral microbiome controls the balance of **molecular oxygen** and **ionic oxygen**.
- Molecular oxygen supports aerobic bugs and keeps anaerobic bugs from overgrowing. Ionic oxygen is a free radical that can damage epithelial cell membranes.
- Bacteria in an **unbalanced microbiome** secrete radical (ionic) oxygen in order to poke holes in cell membranes and get the cytoplasm to leak out—to them, it's just like candy!
- When this happens, we see **gingivitis**.

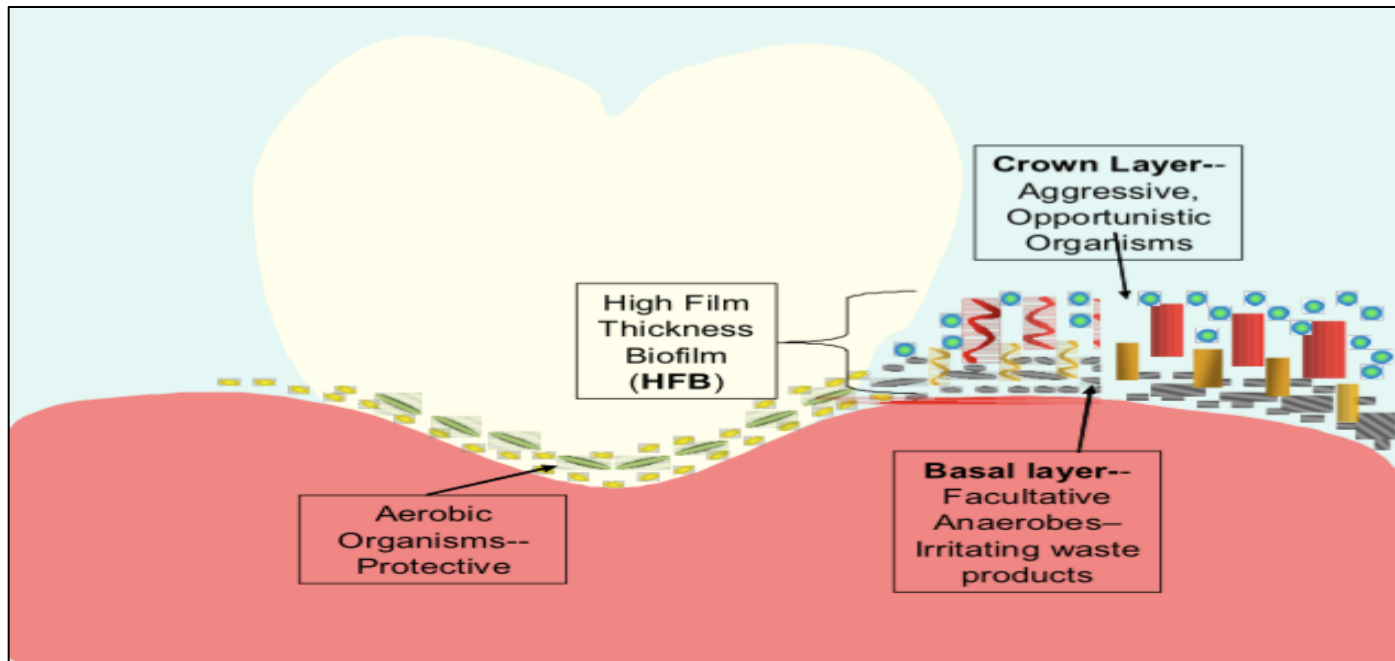
# THE ORAL MICROBIOME

- The bacteria of the oral microbiome form relatively stable structures to assure adequate **nutrient collection**, **waste removal** and **collective survival**.
- It is like a beautiful garden, with many species living in harmony, but also like a bee-hive with a well formed structure and agreed upon job descriptions.





# THE ORAL MICROBIOME



- If the oral microbiome becomes **unbalanced**— the early colonizers get matted down and **convert from aerobes to facultative anaerobes**. These form the ‘soil’ in which true anaerobes take root such as Fusobacterium and Spirochetes.
- The **opportunistic organisms pile up and destroy the architecture of the basal layer** and an entirely different metabolism begins.

# THE ORAL MICROBIOME



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ScienceDirect

Current Opinion in  
Microbiology

## ***Fusobacterium nucleatum*: a commensal-turned pathogen**

Yiping W Han<sup>1,2,3</sup>



*Fusobacterium nucleatum* is an anaerobic oral commensal and a periodontal pathogen associated with a wide spectrum of human diseases. This article reviews its implication in adverse pregnancy outcomes (chorioamnionitis, preterm birth, stillbirth, neonatal sepsis, preeclampsia), GI disorders (colorectal cancer, inflammatory bowel disease, appendicitis), cardiovascular disease, rheumatoid arthritis, respiratory tract infections, Lemierre's syndrome and Alzheimer's disease. The virulence mechanisms involved in the diseases are discussed, with emphasis on its colonization, systemic dissemination, and induction of host inflammatory and tumorigenic responses. The FadA adhesin/invasin conserved in *F. nucleatum* is a key virulence factor and a potential diagnostic marker for *F. nucleatum*-associated diseases.

### Addresses

<sup>1</sup> Division of Periodontics, Section of Oral Diagnostics & Sciences, College of Dental Medicine, Columbia University Medical Center, United States

<sup>2</sup> Department of Microbiology & Immunology, College of Physicians & Surgeons, Columbia University Medical Center, United States

<sup>3</sup> Herbert Irving Comprehensive Cancer Center, Columbia University

*animalis*, *ss fusiforme*, *ss nucleatum*, *ss polymorphum*, and *ss vincentii*, whose prevalence in disease vary [3<sup>\*\*</sup>,4–6]. This article reviews the infections implicating *F. nucleatum*, along with the virulence mechanisms involved.

### Diseases implicating *F. nucleatum*

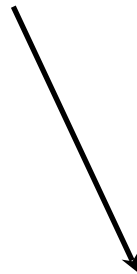
Summarized in Table 1 are diseases in which *F. nucleatum* has been implicated.

### Oral infections

*F. nucleatum* is one of the most abundant species in the oral cavity, in both diseased and healthy individuals [7–10]. It is implicated in various forms of periodontal diseases including the mild reversible form of gingivitis and the advanced irreversible forms of periodontitis including chronic periodontitis, localized aggressive periodontitis and generalized aggressive periodontitis [8–15] (Table 1). It is also frequently associated with endodontic infections such as pulp necrosis and periapical periodontitis [16–22] (Table 1). The prevalence of *F. nucleatum* increases

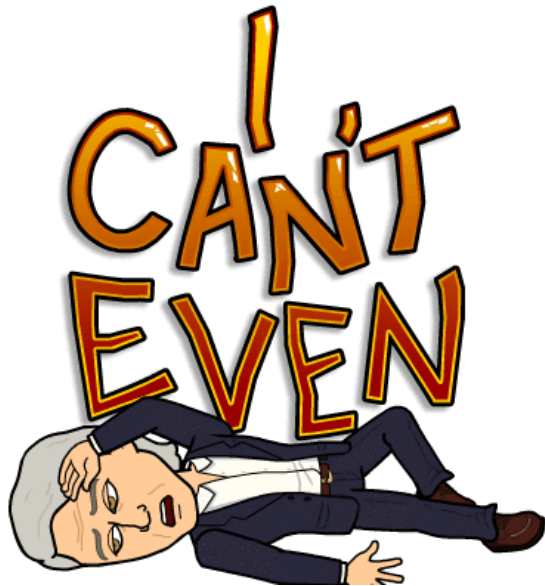
# THE ORAL MICROBIOME

A Change in Assumptions



# THE ORAL MICROBIOME

## Truth in advertising?



Current approaches in Oral Care are not only ineffectual but harmful.



# THE ORAL MICROBIOME

## Chemical used by Colgate Total toothpaste to fight off gum disease is linked to cancer

Colgate Total contains triclosan, which has been linked to cancer and growth malformations in animals.

The toothpaste was approved by the FDA in 1997 - but the toxicology summary reveals the FDA used company-backed evidence to approve it





## Why You Should Never Use Products Containing Triclosan

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1. **Triclosan Has an Almost Indefinite Afterlife in Human Tissue:** Swedish studies found Triclosan in 60% of women's breast milk, even years after mothers had stopped using antibacterial products due to toxicity concerns. The body stores Triclosan in fat cells. (Toxicity is a common cause of inability to lose weight as the body refuses to lose its protective layer of fat in order to avoid flooding the body with toxins).
2. **Triclosan is a Known Endocrine Disruptor:** Multiple scientific studies have proven that Triclosan negatively affects thyroid function in frogs, specifically the metabolism of the thyroid hormones.
3. **Triclosan Is Associated With Antibiotic Resistance:** Other studies have proven that continual use of Triclosan (an antibacterial product) creates antibiotic resistance bacteria. Other studies proved that people who use products containing Triclosan on a daily basis have a higher incidence of resistance to antibiotics than people who do not.

## Why You Should Never Use Products Containing Triclosan

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- 4. Triclosan forms carcinogens when exposed to chlorine in tap water:** When Triclosan is exposed to tap water, such as when you brush your teeth with triclosan toothpaste, it releases chloroform gas, a known carcinogen. Studies also showed the effect is stronger with hot water.
- 5. Triclosan is strongly linked to human disorders:** Although further research is needed to confirm the full effects of Triclosan on the endocrine system, existing research proved Triclosan is dangerous to humans and linked its use to increased rates of asthma, allergies and eczema.
- 6. Triclosan was recently linked to cardiac and skeletal muscular weakness and disorders:** Recent studies found that Triclosan impairs muscular contractions in human cardiac and skeletal muscle cells. Heart muscle strength was reduced by 25% and grip strength by 15% in studies on mice. These effects are already seen in the environment in the form of slower swimming fish and other abnormalities.

# Harmful Ingredients In “Natural” Toothpaste

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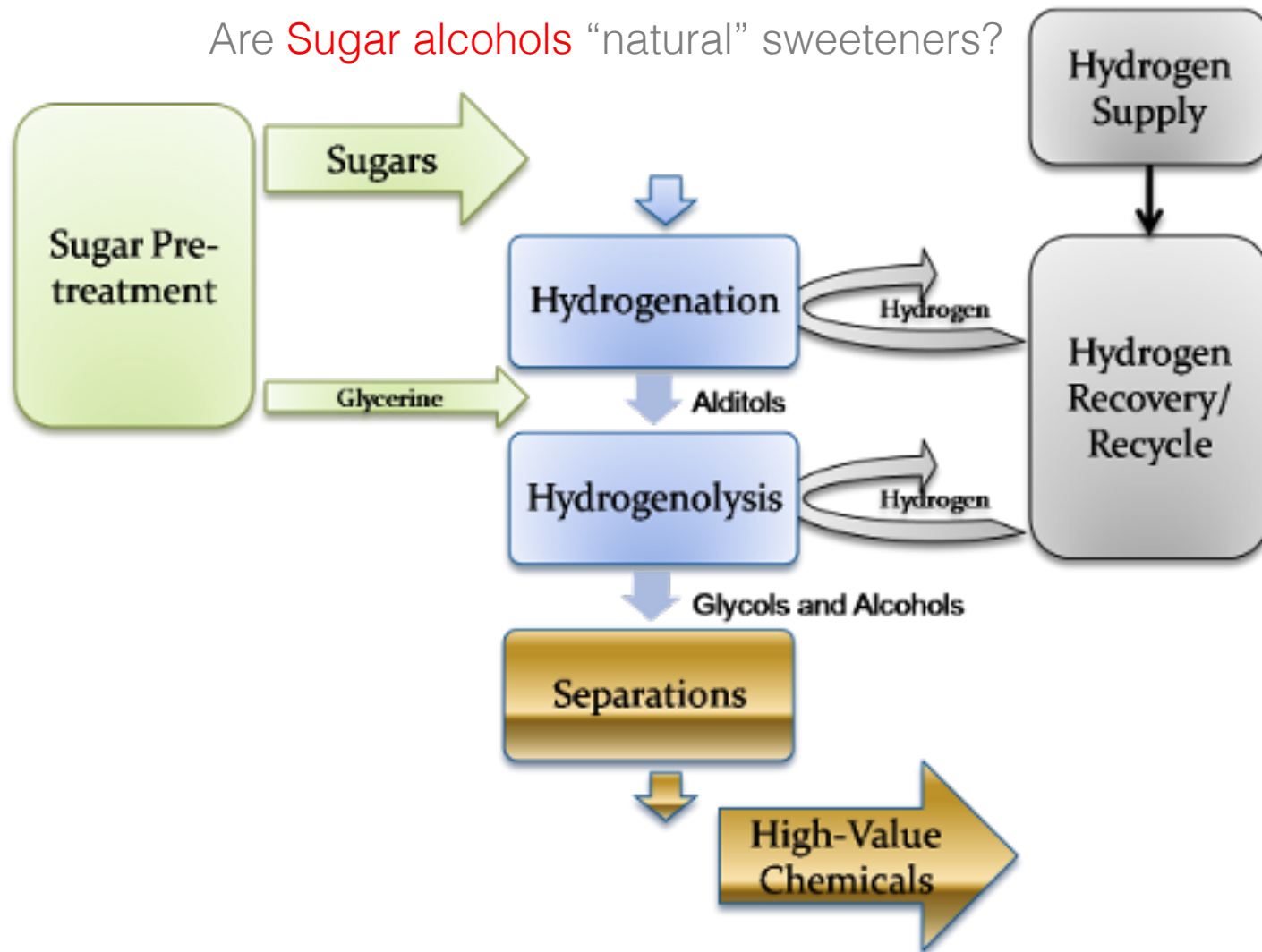
Are the **sugar alcohols** the new “margarines” of the sugar substitute industry?



**XYLITOL**: The “darling of sugar substitutes,” commercial xylitol is a sugar alcohol produced by the industrialized process of sugar hydrogenation with the use of a heavy metal catalyst. In the case of xylitol, Raney nickel, a powdered nickel-aluminum alloy, is often used.

# Harmful Ingredients In “Natural” Toothpaste

Are **Sugar alcohols** “natural” sweeteners?



# Harmful Ingredients In “Natural” Toothpaste

FDA Warns Sweetener Xylitol Can Kill or Poison Dogs - WSJ

5/26/16, 1:11 AM

## THE WALL STREET JOURNAL

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<http://www.wsj.com/articles/fda-warns-sweetener-xylitol-can-kill-or-poison-dogs-1463085523>

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### FDA Warns Sweetener Xylitol Can Kill or Poison Dogs

Warning comes after surge in canine deaths and severe illnesses from ingredient



A type of sugar alcohol, xylitol is an ingredient in many foods. PHOTO: DARRELL WONG/MCT/ZUMA PRESS

By MARK MAREMONT

May 12, 2016 4:38 p.m. ET

The U.S. Food and Drug Administration issued a stronger warning that a common sweetener in chewing gum, mints and other products could kill or severely poison dogs.

The warning comes on the heels of a surge in deaths and severe illnesses from dogs accidentally ingesting the sweetener, xylitol, according to pet poison-control centers. The increase in pet xylitol poisonings was reported last November in The Wall Street Journal.

The FDA warning, titled “Xylitol and Your Dog: Danger, Paws Off,” was issued Thursday by the agency as a “consumer update.” A prior FDA warning, issued in 2011 by the agency’s Center for Veterinary Medicine, briefly warned of potential illness in dogs and ferrets from eating xylitol.

A type of sugar alcohol, xylitol is an ingredient in many foods but “can have devastating effects on your pet,” the FDA said in the latest alert.

Dogs often eat foods and other items that their owners don’t intend. Ingesting just a few pieces of gum can poison even a large dog, experts say, with effects including low blood sugar, seizures, coma, liver damage and possibly death.

The FDA also called attention to the inclusion of xylitol in some nut butters. Owners often give peanut butter to their pets as a treat to get them to take medication.

“We love that [the FDA warning] contains better, more direct language,” said Dr. Jason Nicholas, a Portland, Ore., veterinarian who runs a website, PreventiveVet.com, which has called for more action on xylitol poisonings.

Dr. Nicholas said he hopes the FDA will require that food packaging include the weight or amount of xylitol per serving, and a clear symbol or text warning of the danger xylitol

<http://www.wsj.com/articles/fda-warns-sweetener-xylitol-can-kill-or-poison-dogs-1463085523>

Page 1 of 2

# Harmful Ingredients In “Natural” Toothpaste

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(read the label ingredients and learn)



**Tea Tree Oil:** volatile oil with powerful antimicrobial not suitable for Eyes, Mouth, Nose, Pets, Allergies, destroys bacteria, denatures oral microbiome.

**Licorice root:** powerful antimicrobial properties. Two natural isoflavone compounds derived from licorice root, glabridin and glabrene, demonstrate estrogen-like activities.

**Tulsi Oil:** volatile oil with antimicrobial properties.

**Xylitol:** antimicrobial (bacteria inhibitor).



# THE ORAL MICROBIOME

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## Smiles All Around

A pair of dentists put their wisdom teeth together to create healthy, happy mouths.

**As science began to reveal** a connection between gum disease and health problems such as strokes and heart attacks, it became obvious to two former NYU dental-school classmates that something needed to be done. A decade after graduation, Drs. Gerald P. Curatola and David Shuch, both 47, reunited to find a solution. Says Curatola, “There hasn’t been any real innovation in terms of science in oral care since Sputnik went up and Eisenhower was president.”

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The World's First **Prebiotic** Oral Care Formulation.



A biologically effective, **prebiotic** formulation promoting **homeostasis** (balance) of the naturally occurring oral microbiome.

Combines essential antioxidants and cell energy enhancers CoQ-10, Vitamin C, Vitamin E, MSM, as well as a unique blend of microminerals, in a natural and organic base flavored with organic stevia.

# Revitin Clinical Research

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## **Analysis of Capacity of Novel, Antioxidant Toothpaste to Reduce Gingival Inflammation in Pilot, Small-population Clinical Study: Comparison to Levels of Gingival Inflammation Reduction Reported in Historical Control and Therapeutic Toothbrushing Studies.**

**Anita H. Daniels, R.D.H.\***

Adjunct Clinical Instructor  
University of Miami, School of Medicine  
Department of Dental Implants

**Steven R. Jefferies M.S., D.D.S.†**

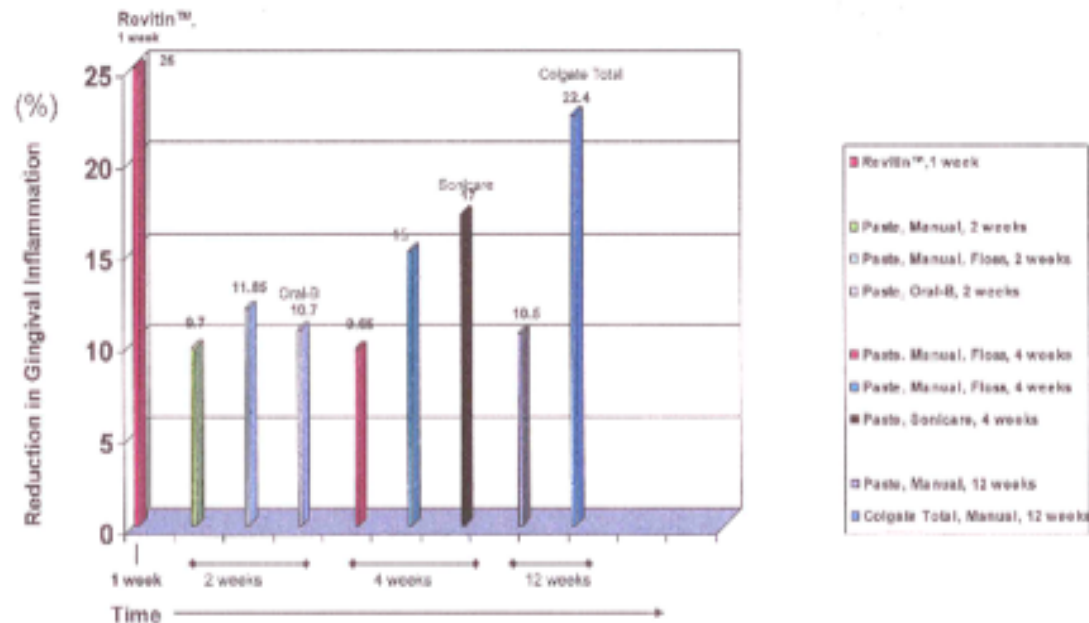
Temple University, School of Dentistry  
Professor, Department of Restorative Dentistry  
Dir. of Clinical Research & Biomaterials Research Laboratory

### **Background**

Despite decades of effort, gingivo-perio dysfunction remains a significant threat to oral health, lifetime tooth retention and systemic health including effects on vascular endothelium and complications of pregnancy<sup>1,2,3,4,5</sup>. Treatment of this spectrum of disorders typically involves oral hygiene measures designed to reduce plaque retention, antimicrobial therapy to suppress bacteria, scaling and root planing where indicated to remove mineralized bacterial colonies, and surgical approaches to debride inaccessible areas. At the basis for these therapies is an underlying assumption that plaque is fundamentally pathogenic and must be stripped away and disinfected as part of any long term strategy of managing this disease.

# Revitin Clinical Research

**Fig.1: Reduction in Gingival Inflammation vs. Various Oral Hygiene Therapeutic Modalities**



# Revitin Clinical Research

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## **An Evaluation of the Effectiveness of an Experimental Oral Therapy Paste (Revitin™ with NuPath® Bioactives) on Oral Soft Tissue Health**

C. H. Pameijer <sup>(1)</sup>, N. Grande <sup>(2)</sup>, G. Plotino <sup>(2)</sup>, A. Butti<sup>(2)</sup>, A. Lerda<sup>(3)</sup>, V. Pasquali<sup>(3)</sup> <sup>1</sup>Professor Emeritus University of Connecticut; Hartford, CT; <sup>2</sup>School of Dentistry, Catholic University of Rome, Italy. <sup>3</sup>Private Practice, Rome, Italy

### **Background**

Emerging science has linked the breakdown in oral health to a degenerating oral biofilm where the ecology of the microbial community taken as a collective, rather than as specific putative species, seems to be the best model for understanding the dynamics and thus for designing effective treatment. Standard detergent-based toothpastes attempt to eliminate the oral biofilm which precludes any valuable function that a healthy biofilm might perform in maintaining oral health. An experimental oral therapy paste designed to shift a degenerative oral biofilm towards an ecology compatible with oral health, has been proposed. An initial pilot study in humans showed a 25% reduction in gingival inflammation after 7 days of use ( $p < 0.05$ ). This study seeks to evaluate the effects of this paste (R), on plaque index (PI), gingival index (GI), and bleeding index (BI) as compared to a standard detergent-based toothpaste (Crest® Whitening Expressions) as control (C).

### **Method**



# Revitin Clinical Research

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42%

Reduction In  
Gingival  
Inflammation



46%

Reduction In  
Plaque



72.5%

Reduction in  
Bleeding

After fourteen days over a leading toothpaste\*  
(\*Crest Pro-Health Toothpaste)

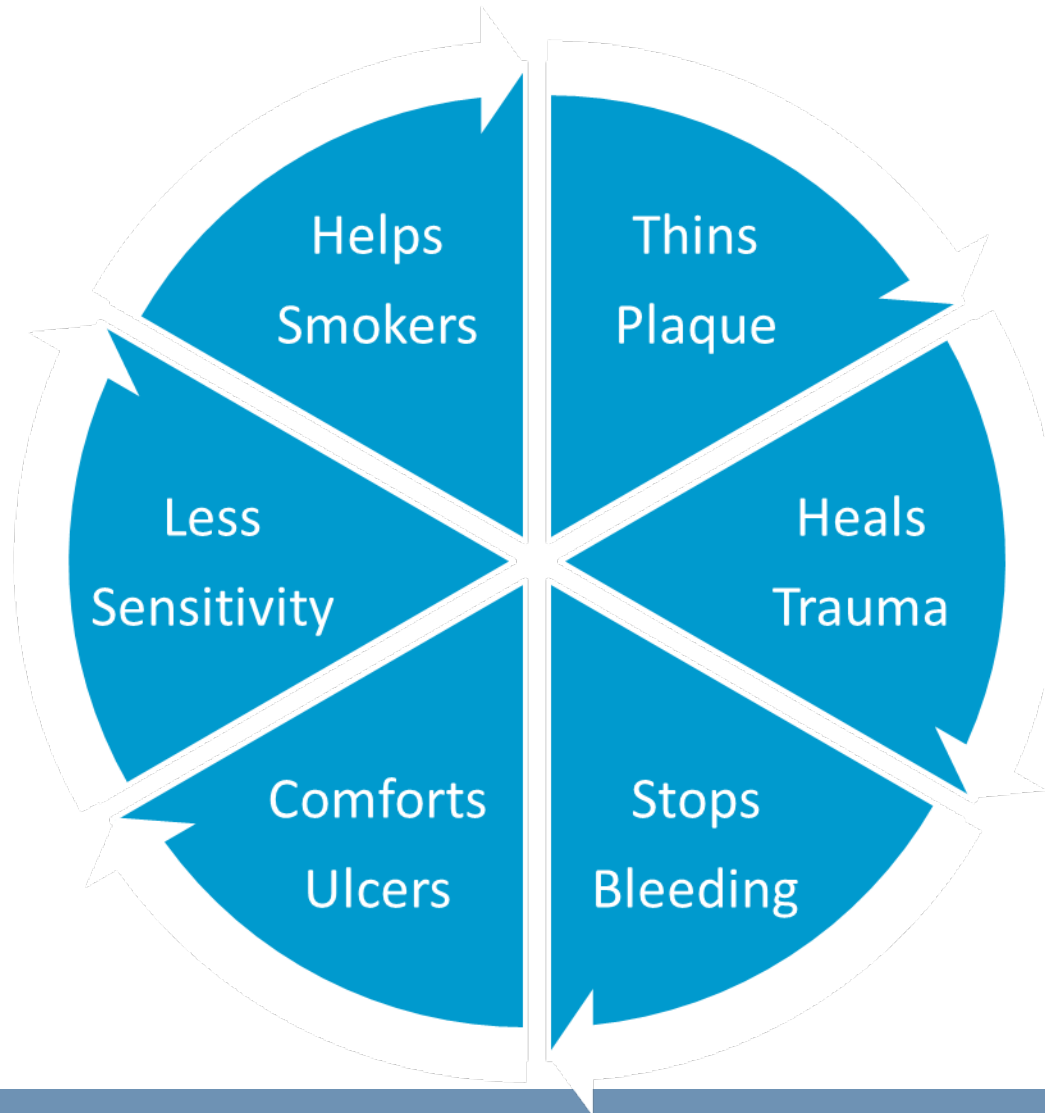
# Revitin Clinical Research

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This study confirms the findings of the pilot study and does so with a higher degree of statistical certainty ( $p < 0.001$ ). The experimental oral therapy paste showed statistically and clinically significant improvements over the control paste for PI, BI and GI of, respectively, 46%, 72.5%, and 42% after fourteen days of use.

# Revitin Clinical Research

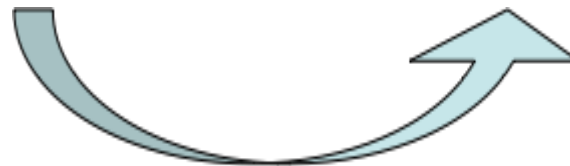
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# Revitin Clinical Research

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Red, bleeding gums become pink, firm, and healthy.

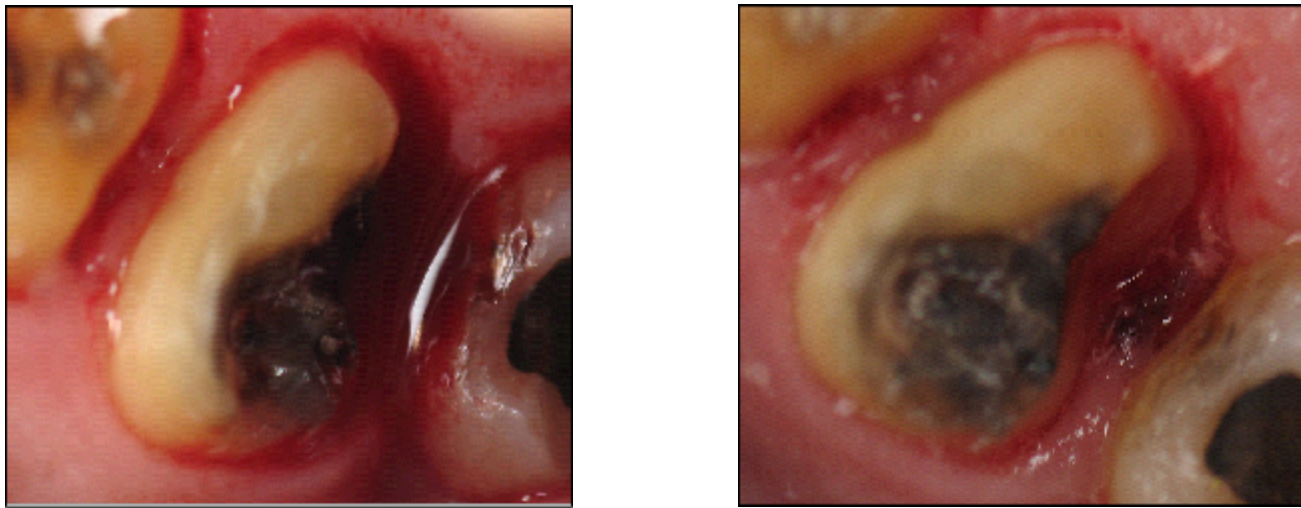


Four Days, Revitin Only

# Revitin Clinical Research

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Gum tissue trauma heals up faster.



Seven Minutes, Revitin Only



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Dr. Gerry's

**MOUTH ↔ BODY**

**CONNECTION**

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# Follow Dr. Gerry on Twitter and Facebook:

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Twitter: @drgerrycuratola

Twitter: @Revitin

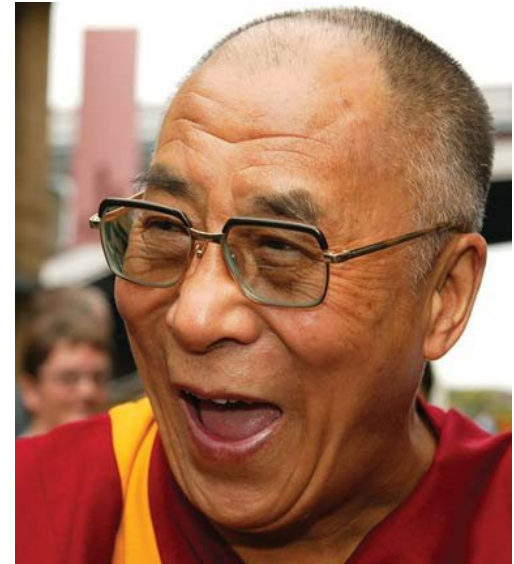
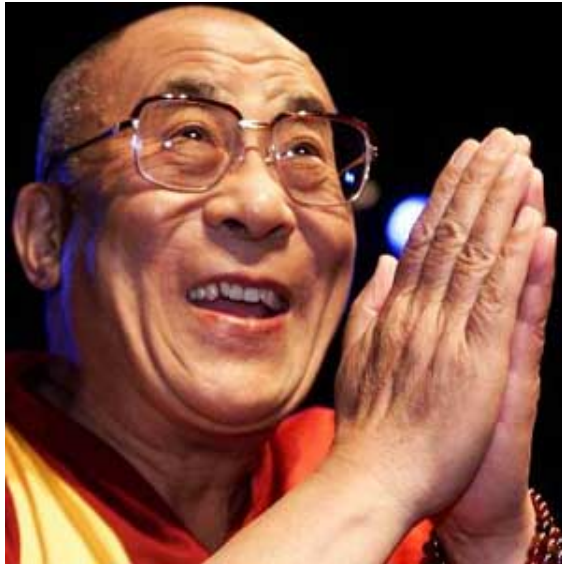
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# Thank You!

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“Smile if you want a smile from another face.”

– Dalai Lama