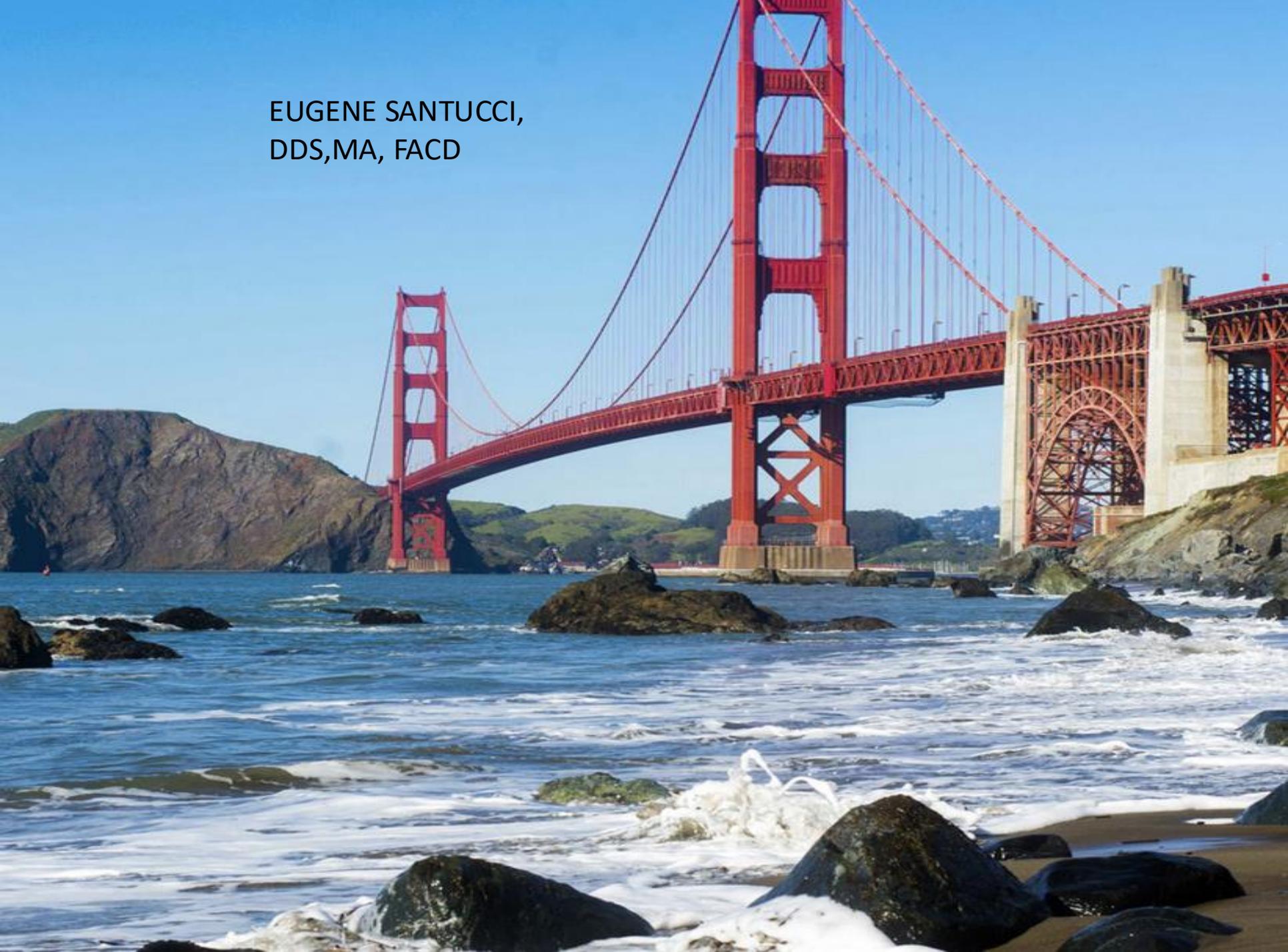




GULF COAST DENTAL CONFERENCE

EUGENE SANTUCCI,  
DDS,MA, FACD



# Dental Sleep Medicine



- What Every Dentist and Hygienist Should Know
- Concepts Treatment Products

- I have nothing to disclose but wish to thank the vendors for their support.
- I personally use the products mentioned in the presentation

# Educational Partners

- Kettenbach America
- Perio-protect
- Hydrasmile
- Directa
- G C America
- Procter & Gamble
- Shofu



# Sleep Dentistry

The New Kid on the Block



Become the Dentist  
and Hygienist of  
Tomorrow, Today

- Your Role in The National Pandemic
- of
- Disturbed Sleep

# Top 3 Factors Stealing Sleep from Americans, According to Dreem Health Report

Apr 7, 2025 | Parameters | 0 | ★★★★★





While 97% of Americans recognize the importance of sleep, only 7% wake up feeling well-rested daily, according to a new report from Dreem Health, a digital sleep clinic managed by [The Sunrise Group](#).

Stress and anxiety are the biggest culprits (54%) of sleep interruptions, followed by noise and light disturbances (44%), and snoring or breathing difficulties (21%) rounding out the top three factors stealing sleep from Americans. As a result, they face difficulty concentrating (41%), mood swings (40%), and anxiety (31%) during the time they're awake.





## **ResMed Survey: Despite Sleep Problems, Few Willing to Take Proactive Steps**

The fifth annual Global Sleep Survey by ResMed reports on the gap between sleep

Just one night of lost sleep can keep beta-amyloid levels higher than usual. The problem is not so much a single night's poor sleep, which you can compensate for, but a cumulative pattern of sleep loss, leading to decreases in the structural integrity, size, and function of brain regions like the thalamus and hippocampus, which are especially vulnerable to damage during the early stages of Alzheimer's disease.

Reap the many health benefits of a good night's rest, check out [\*\*\*Improving Sleep: A guide to a good night's rest\*\*\*](#), a Special Health Report from Harvard Medical School.

# DENTAL SLEEP MEDICINE *Basics*

*The clinical guide to treating obstructive sleep apnea*



- The Link Between Gerds, TMD, Erosion, Bruxing and Disturbed Sleep





Break Time



What Does This Involve?





- The title and scope of this message is quite broad so again what is our purpose?
- We are adhering to the 2017 policy statement by the ADA regarding this very subject

ADA American Dental Association®  
America's leading advocate for oral health

## ADANews

Current Issue

**Sleep-related breathing disorder  
treatment outlined in new policy**

October 31, 2017

By David Burger

*Atlanta* — Dentists are the only health care provider with the knowledge and expertise to provide oral appliance therapy, according to Resolution 17H-2017 passed by the ADA House of Delegates at ADA 2017 – America's Dental Meeting.

"The passage of the sleep-related breathing disorders policy statement is the culmination of several years of work on this issue through the combined efforts of the Council on Dental Practice and the Council on Scientific Affairs," said Dr. Craig Ratner, chair of the ADA Council on Dental Practice. "The consensus-based process engaged all interested parties. The end result is a comprehensive policy that can help dentists on the front lines help their patients with these potentially life-threatening disorders. Proper recognition and treatment can help prolong the health and lives of our patients."

# Task Force Report 2015

- Sleep Medicine in Dental Education
- A vision for incorporating sleep medicine science and practice into the programs of the University of the Pacific Arthur Dugoni School of Dentistry

- Artemiz Adkins DDS
- Eugene Santucci DDS,MA
- Andrew Young DDS, MSD
- Darren Cox DDS, MBA
- Gilles Lavigne DMD, M.Sc, PhD,
- Christian Guillemineault MD,
- Steven Olmos DDS



- This is a Public Health issue that the ADA is asking for help.



- Why Dentistry?

- trained to complete a head/neck exam  
We are thoroughly

- The intra oral exam is our sandbox

- Md's don't have the time nor experience to be at the forefront of this public health issue, we do.

# Dental Office Implementation

- Understand the co-morbidities that are greatly influenced by sleep disturbances
  - Be able to discuss the effects poor sleep has on daily lives of patients
- Should we be the one of the main gatekeepers to help our patients?
  - ADA recommends we should be the gatekeepers
  - ADA so stated by passing [Resolution 2017-17a-2017](#)





*Dorsal Fin Appliance*



*Narval Appliance*



*EMA Appliance*



*TAP Appliance*



*Herbst Appliance*

Image

# Today's / Purpose

- Importance for Staff, Hygienist and Doctors
- Are you open to accept a few new paradigms and changes as you interact and educate your patients?
- Some areas may seem out of your area of expertise or comfort but I will attempt to make it relevant to your position in the office.
- We have a rigid way of thinking. How we run our practice.
- Why? Knowledge is Powerful



# Today's Topics

- We'll cover some background material on sleep disorders
- What to look for in your routine dental exam
- What to do if you find positive landmarks
- What to do if you chose to add sleep therapy to your office procedures
- Clinical review of head and intra-oral anatomy

Basic general dental treatments you can provide your patients suffering from disturbed sleep

# Learning Objectives

- Explore the 2017 ADA resolution regarding your office's role regarding the detection , referral or treatment of disturbed sleep in our patients
- 40 million adults and children suffer from disturbed sleep, simple steps to help
- Explore the effect of disturbed sleep on total body health, various co-morbidities and how this may effect your general dentistry and hygiene procedures
- Understand why a child experiencing ADHD symptoms may be the result of poor sleep

# Learning Objectives Specifically Dentally Related to Sleep

Explore the basics of sleep, disturbed sleep

ADHD in children and adults

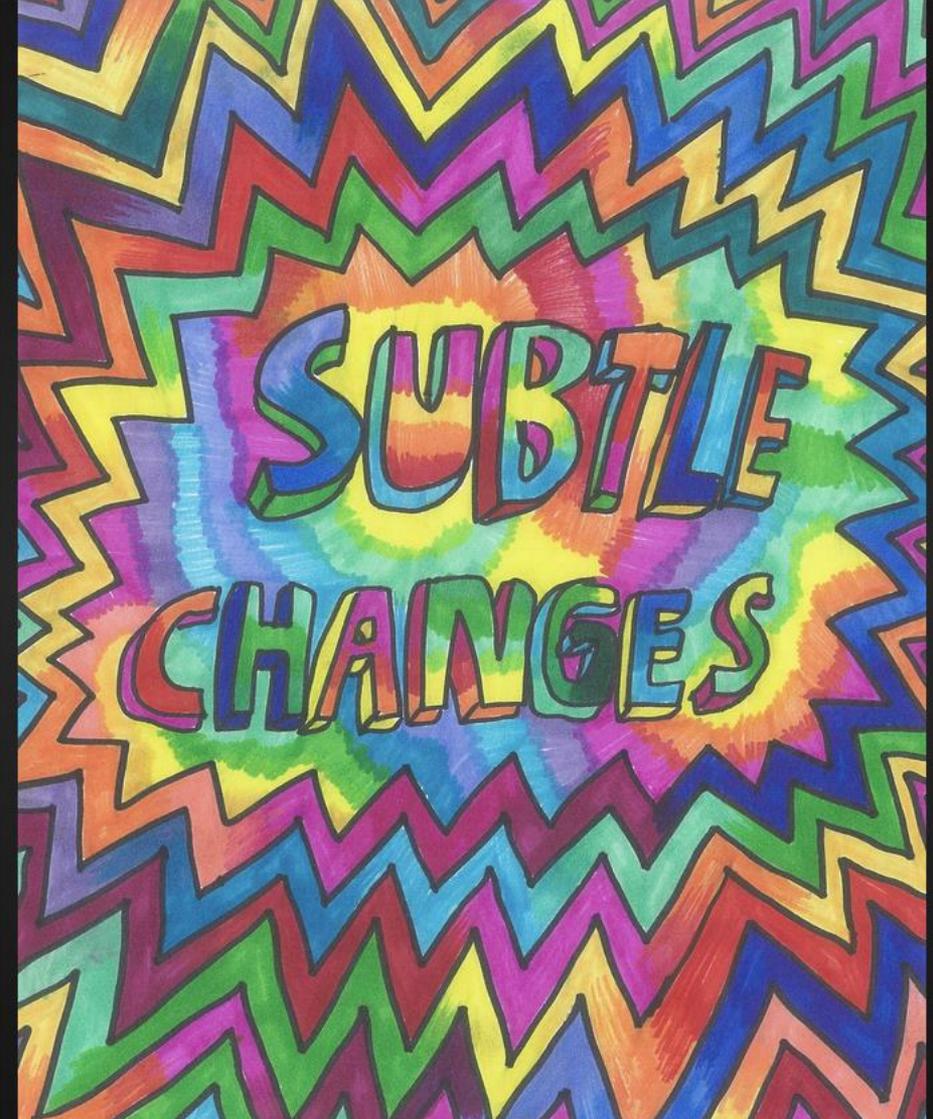
Bruxism, one type? Myths



Hygienists, are all fluorides alike, one for all patient types

What is the role of saliva?

How do we restore acid attack lesions, do we, should we?



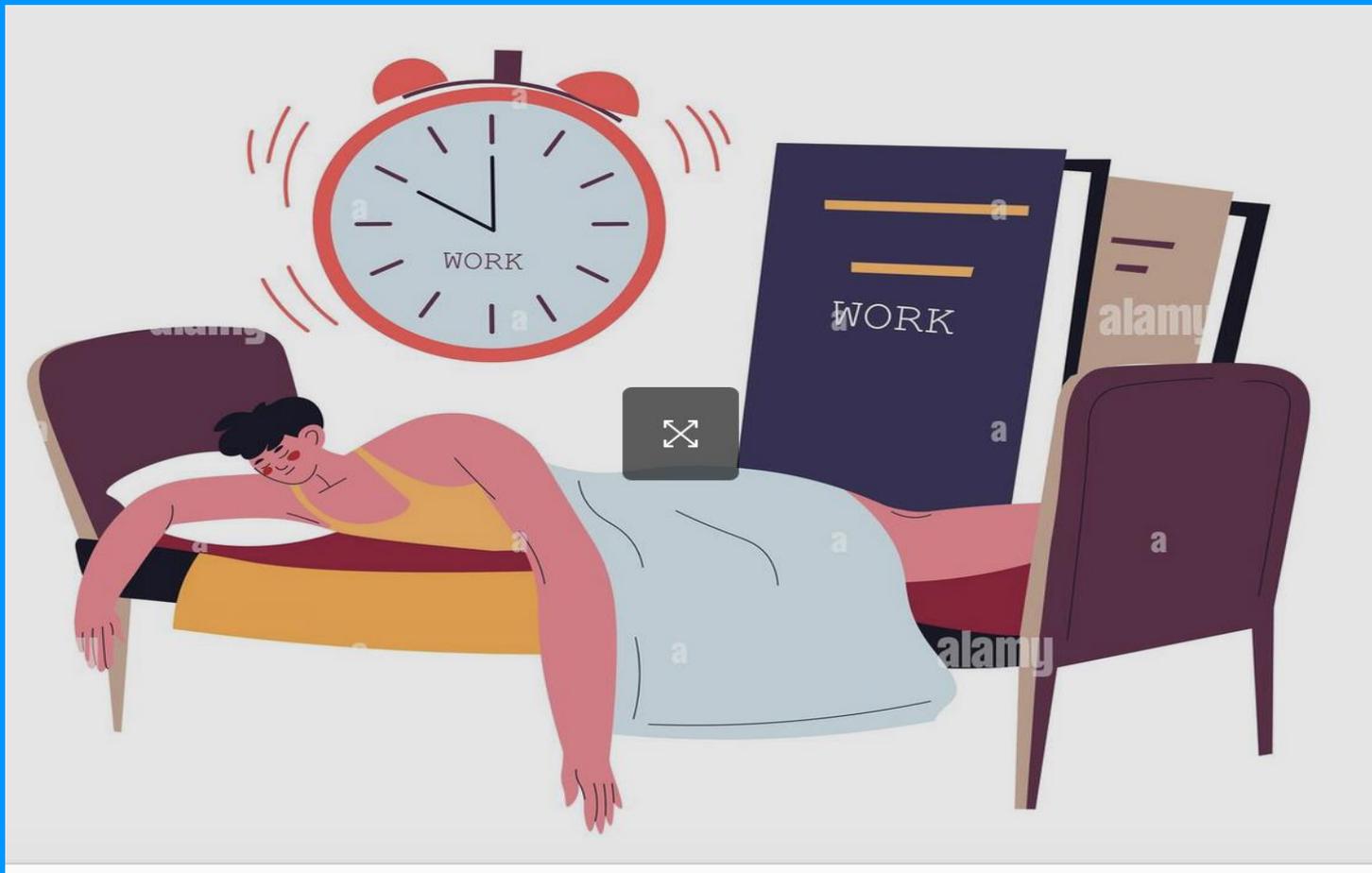


**What topic would  
you like to talk  
about?**



# Sleep

## A Universal Addiction



# SLEEP

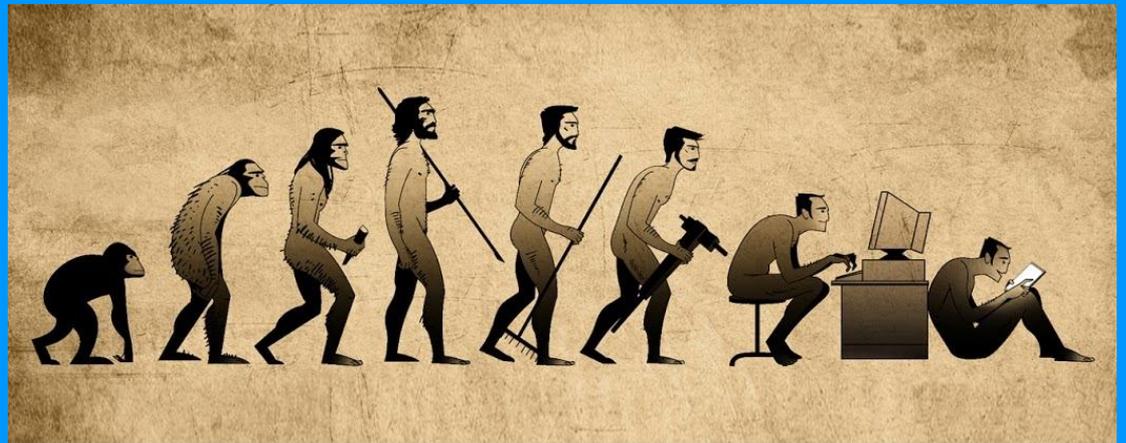
Normal sleep is defined as the cyclic temporary and physiologic loss of consciousness that is readily, promptly, and completely reversed with appropriate stimuli

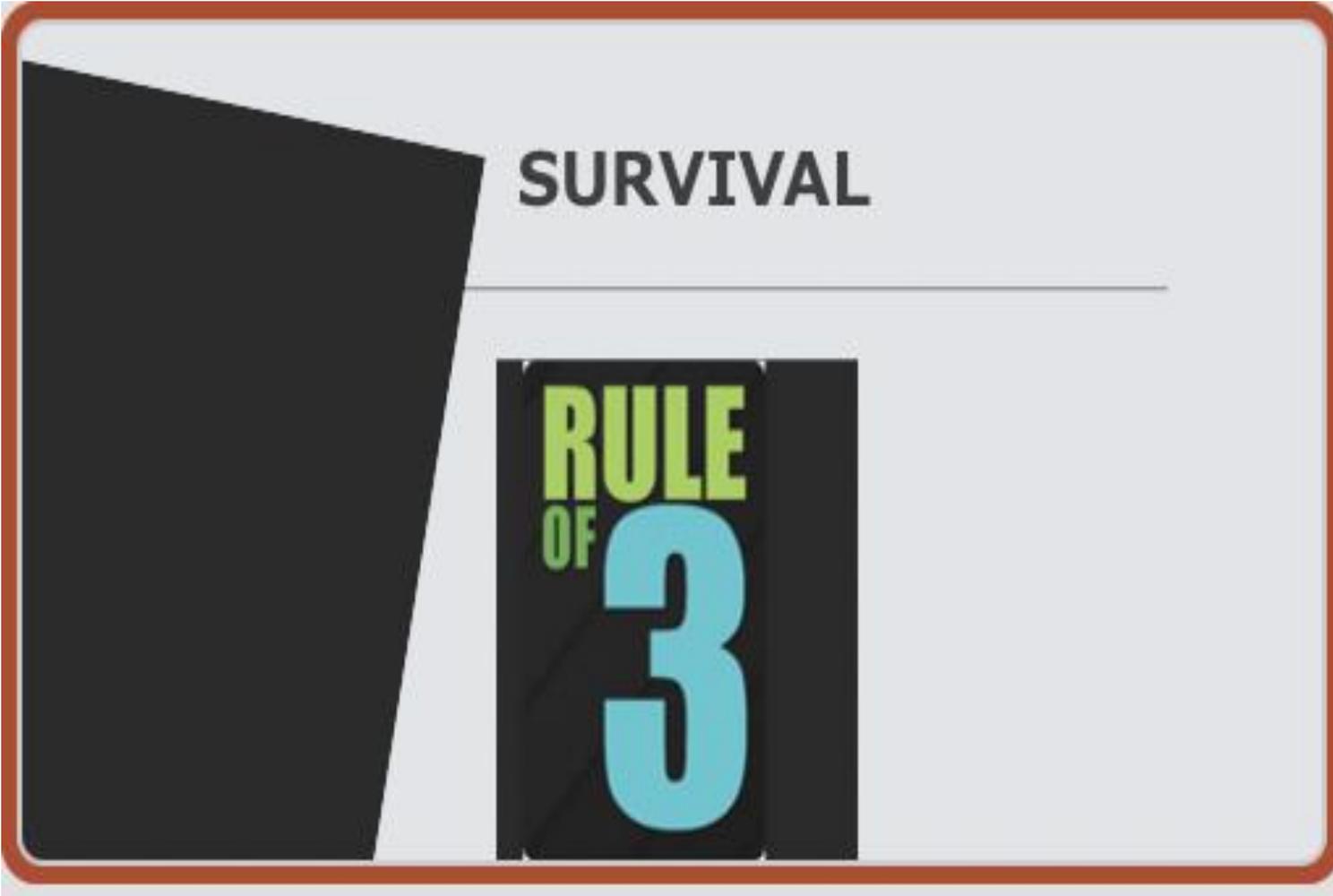


- Is sleep an addiction we don't understand
- We understand why we eat, drink, reproduce

*“If sleep doesn't serve an absolutely vital function, then it's the biggest mistake the evolutionary process ever made.”*

Dr. Allen Rechtschaffen





**SURVIVAL**

---

**RULE  
OF  
3**

**You Can survive 3 weeks without food**

---



## You Can Survive 3 Days without drinkable Water

---



## You Can survive 3 Hours in Extreme Enviornments, Heat, Cold

---



## You Can Survive 3 Minutes Without Oxygen

---



Breathing is not optional



8890

23,040

55,059

103,090

How many breaths does an average human take each day

- US Public Health Service, National Health and Nutrition Survey 2005-6 reports;
- 53% of men snore 3 times /week
- 14.3 % snore and gasp
- 6.1% are diagnosed with OSA
- 70% have some sort of sleep disordered breathing



# Avon Study

- SDB is common in childhood, parents reported on child's snoring, mouth breathing and apnea
- SDB was associated with behavioral difficulties was associated with 40% of 4/yr/olds and 60% of 7/yr/olds. Mostly demonstrated as inattentiveness and hyperactivity



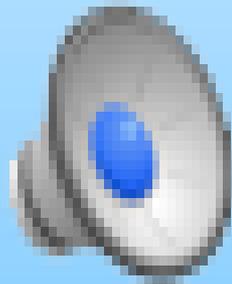
# I Love my Alarm

- I love my alarm clock, I never hit the snooze button
- I'm so full of energy, lets get this day started
- I don't need any more sleep



*You may have disturbed sleep if:*

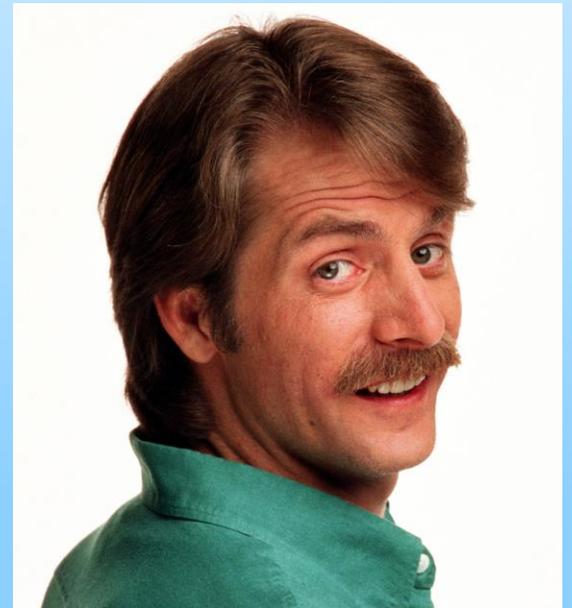
You slept 8 hrs but move like a sloth



# Jeff Foxworthy

## You just might be a redneck if:

- You mowed the front lawn and found a car
- You consider 5<sup>th</sup> grade as your senior year
- You took a fishing pole to Seaworld
- Your family tree is a straight line with no branches



# Do any of You ??

- Wake up frequently to use the BR
- Feel sleepy during the day/ driving
- Clench/grind your teeth at night
- Diabetes ,High BP or CVD
- Overweight, Obese, Sugar Cravings
- Exhibit Mental Fog
- Too tired to Exercise

*You may have disturbed sleep if:*

You need a coffee maker bedside so that you can make it to the bathroom in the morning



# Possible Reasons for your Fatigue

- Chronotype: are you an early bird or night owl? If your a night owl and don't fall asleep early enough to get your 7-8 hours of restful sleep, your fighting your natural circadian rhythm.
- Fragmented sleep/ snooze alarm
- Bedroom environment/ blue light
- Spouse behavior
- Alcohol / caffeine



# You my Friend

- Most likely don't get enough sleep or you have an airway issue that keeps you from sleeping deeply and restfully
- National Institute of Health reports 20% of adults have obstructive sleep apnea of which 90% go undiagnosed
- Women; 40% suffer from Upper Airway Resistance Syndrome, also not diagnosed





# How Your Dentist Can Help With Sleep Apnea

A photograph of a man lying in bed, covered with a white sheet. He has his eyes closed and his mouth is wide open, which is a common sign of sleep apnea. The background is a soft, light blue color. The text is overlaid on the left side of the image.



# STOP BANG\*

## Screening Questionnaire for Obstructive Sleep Apnea (OSA)

**Find out if you are at risk for Sleep Apnea!**

<b>S . Snore</b>	Have you been told that you <u>snore</u> ?	Yes	No
<b>T . Tired</b>	Are you often <u>tired</u> during the day?	Yes	No
<b>O . Observed</b>	Has anyone <u>observed</u> you stop breathing while sleeping?	Yes	No
<b>P . Pressure</b>	Do you have or are you being treated for high blood <u>pressure</u> ?	Yes	No

<b>B . BMI</b>	Is your <u>BMI</u> more than 35 kg/m <sup>2</sup> ?	Yes	No
<b>A . Age</b>	Is your <u>age</u> 50 years old or older?	Yes	No
<b>N . Neck</b>	Is your <u>neck</u> circumference greater than 17" if male, or 16" if female?	Yes	No
<b>G . Gender</b>	Is your <u>gender</u> male?	Yes	No

▶ If you answered **YES** to **2** or more questions, it is very likely that you are at **significant risk for OSA**

▶ If you answered **YES** to **3** or more questions, it is very likely that you have **moderate to severe OSA**.

**Untreated moderate to severe Obstructive Sleep Apnea has been associated with hypertension, heart attack, stroke, diabetes, obesity, motor vehicle accidents, memory impairment, impotence, headaches as well as a decreased quality of life.**

**Please discuss your results with your physician. A sleep study or an evaluation by a sleep specialist may be warranted.**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Ht.	Wt. (lbs)	Ht.	Wt. (lbs)
4' 10"	167	5' 8"	230
4' 11"	173	5' 9"	237
5'	179	5' 10"	243
5' 1"	185	5' 11"	250
5' 2"	191	6'	258
5' 3"	197	6' 1"	265
5' 4"	204	6' 2"	272
5' 5"	210	6' 3"	279
5' 6"	216	6' 4"	287
5' 7"	223	6' 5"	295

Weight shown in this table represents those with a Body Mass Index of 35 for a specific height.

[www.baysleep.com](http://www.baysleep.com) ☎ 866-88-SNORE (866-887-6673)

Copyright© 2012 Bay Sleep Clinic. All rights reserved.

\*F. Chung, B.Yegneswaran, P. Liao, S. Chung, S. Vairavanathan, S. Islam, A. Khajehdehi, C.M. Shapiro; Anesthesiology 2008; 108:812-21

# STOP BANG

- EACH POSITIVE SCORE IS ONE POINT
- 0-2 low risk for obstructive sleep apnea
- 3-4 intermediate risk for obstructive sleep apnea
- 5-8 high risk for obstructive sleep apnea

# Epworth Sleepiness Scale (ESS)

Situation	Chance of dozing (0–3)			
Sitting and reading	0	1	2	3
Watching television	0	1	2	3
Sitting inactive in a public place—for example, a theater or meeting	0	1	2	3
As a passenger in a car for an hour without a break	0	1	2	3
Lying down to rest in the afternoon	0	1	2	3
Sitting and talking to someone	0	1	2	3
Sitting quietly after lunch (when you've had no alcohol)	0	1	2	3
In a car, while stopped in traffic	0	1	2	3
<b>Total Score</b>				

0 = would never doze 1 = slight chance of dozing 2 = moderate chance of dozing 3 = high chance of dozing

Johns MW. *Sleep*. 1991;14:540



## Pediatric Sleep Questionnaire

Patient Name: \_\_\_\_\_

Date of Birth: \_\_\_\_\_

	Yes	No	Don't Know
<b>While sleeping does your child...</b>			
Snore more than half the time?			
Always snore?			
Snore loudly?			
Have "heavy" or loud breathing?			
Have trouble breathing or struggle to breathe?			
<b>Have you ever...</b>			
Seen your child stop breathing during the night?			
<b>Does your child...</b>			
Tend to breathe through the mouth during the day?			
Have a dry mouth on waking up in the morning?			
Occasionally wet the bed?			
Wake up feeling un-refreshed in the morning?			
Have a problem with sleepiness during the day?			
Has a teacher or other supervisor commented that your child appears sleepy during the day?			
Is it hard to wake your child up in the morning?			
Does your child wake up with headaches in the morning?			
Did your child stop growing at a normal rate at any time since birth?			
Is your child overweight?			
<b>This child often...</b>			
Does not seem to listen when spoken to directly			
Has difficulty organizing tasks			
Is easily distracted by extraneous stimuli			
Fidgets with hands or feet or squirms in seat			
Is "on the go" or often acts as if "driven by a motor"			
Interrupts or intrudes on others (e.g. butts into conversations or games)			

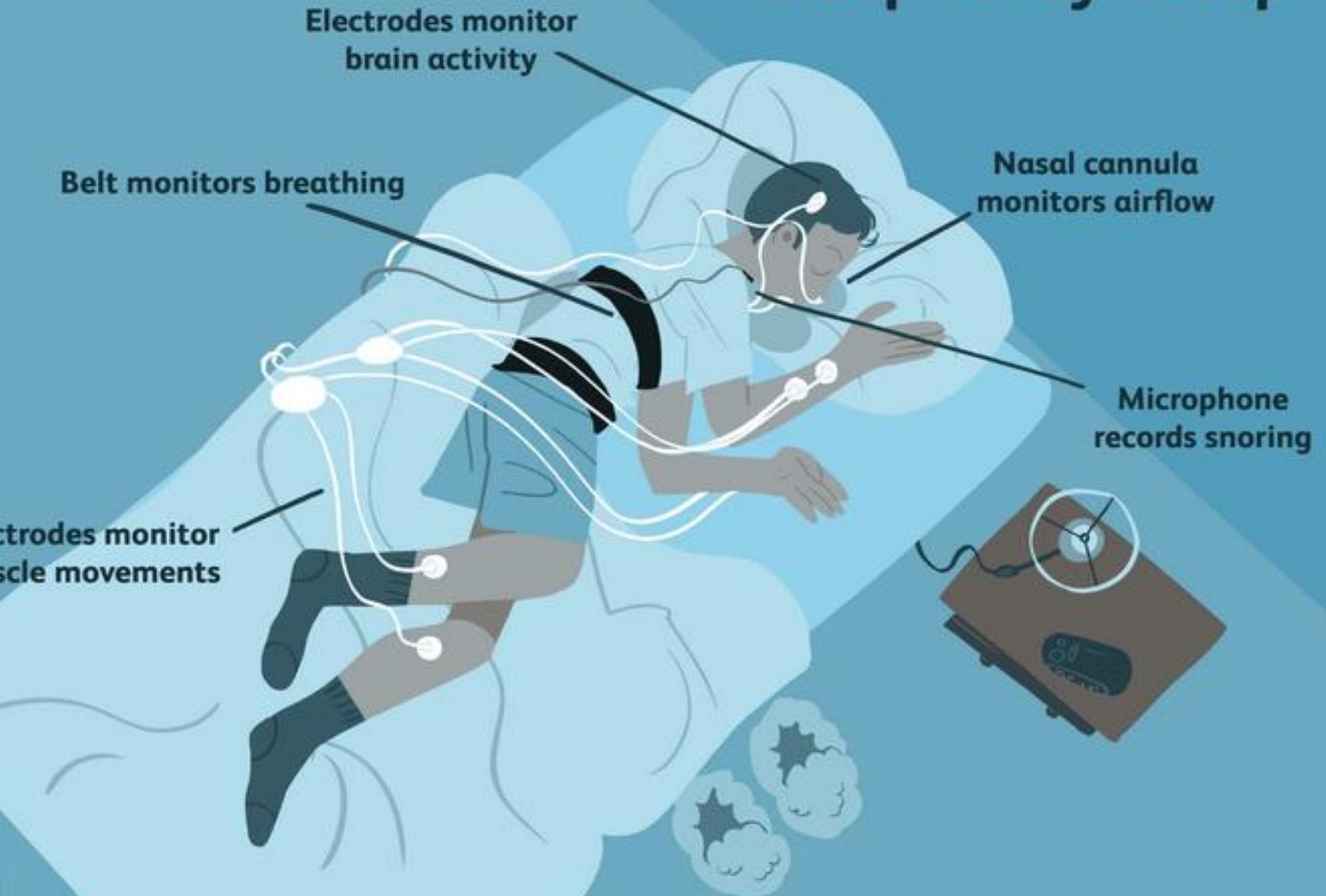
Total Number of "Yes" Responses \_\_\_\_\_

If eight or more statements are answered "yes", consider referring for sleep evaluation

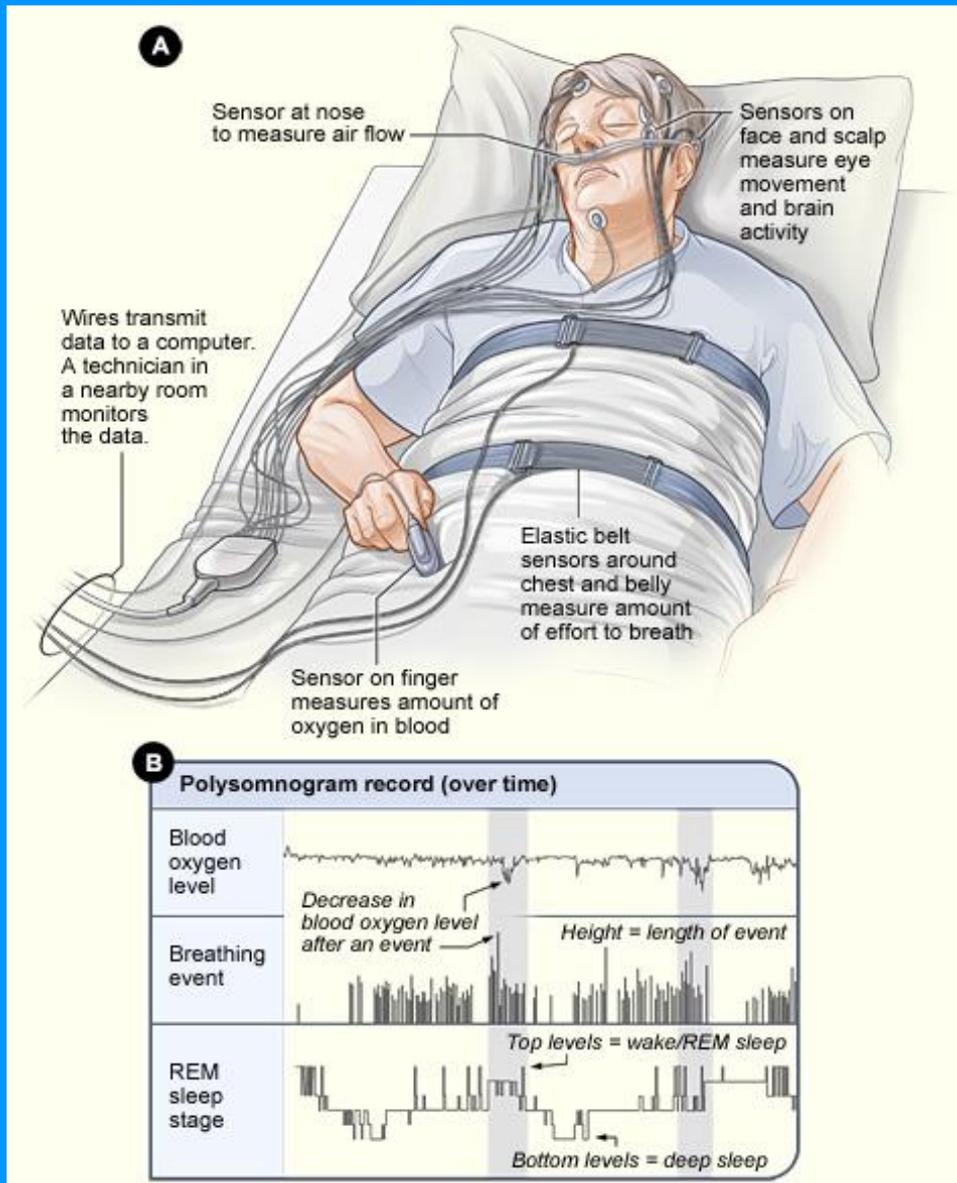
refer



# Sleep Study Setup



# Hospital Version

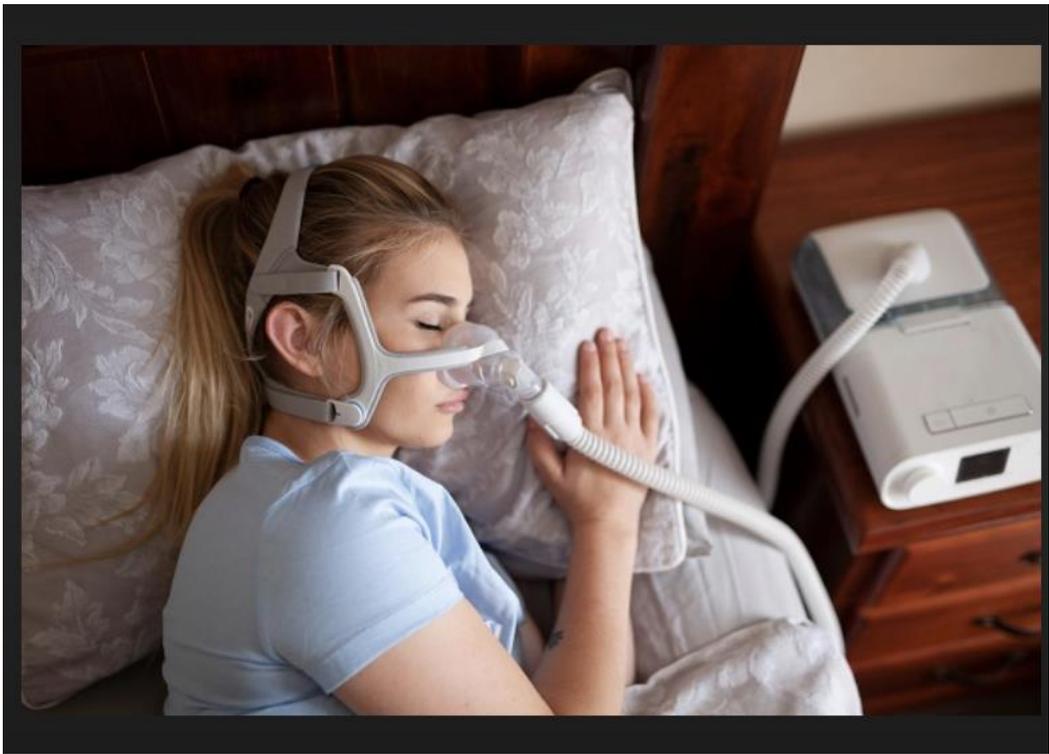


# Take Home Version



## C-PAP Machine





# Mandibular Advancement Appliances



Fjkljsklfjaskljf;lkasjdf;lkajs;lk



# Lullaby<sup>TM</sup>

## PEDIATRIC SENSORS

The most advanced and innovative family of diagnostic sleep sensors made especially for pediatric patients.

by **DyMedix**<sup>®</sup>  
DIAGNOSTICS



# DIAGNOSIS

- Only a sleep study interpreted by a medical sleep specialist in conjunction with a medical exam can rule in or out benign snoring
- **Polysomnogram** (sleep study) may be hospital based or take home models are becoming increasingly popular
- Following a diagnosis, treatment available;
  - C-PAP: Highly effective, low compliance
  - MAD: Slightly lower effect, high compliance

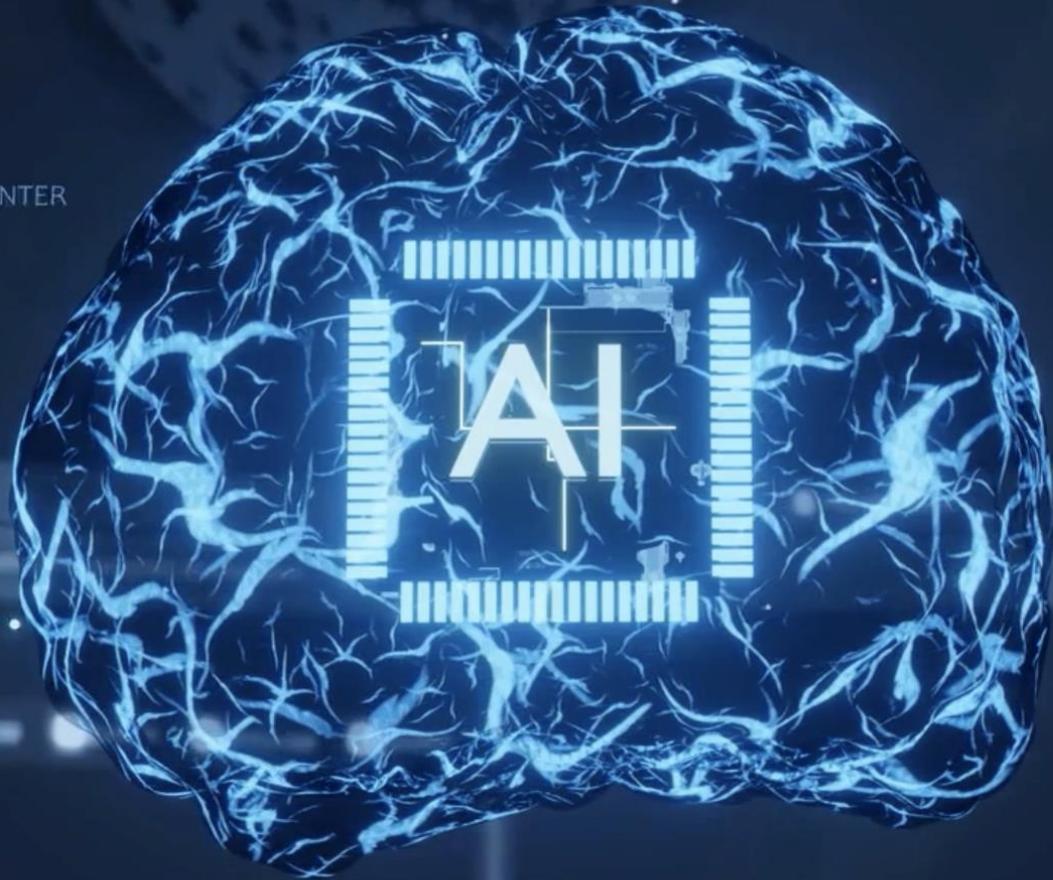


# Enhancing Artificial Intelligence-Driven Sleep Apnea Diagnosis: The Critical Importance of Input Signal Proficiency with a Focus on Mandibular Jaw Movements

Corresponding author: Jean-Benoit Martinot

Email Id: [martinot.j@respisom.be](mailto:martinot.j@respisom.be)

CENTER



**intelligence (AI) can help  
obstructive sleep apnea (OSA)**

REVIEW |  Full Access

# Enhancing artificial intelligence-driven sleep apnea diagnosis: The critical importance of input signal proficiency with a focus on mandibular jaw movements

Jean-Benoit Martinot MD , Nhat-Nam Le-Dong MD, PhD, Atul Malhotra MD, Jean-Louis Pépin MD, PhD

First published: 15 December 2024 | <https://doi.org/10.1111/jopr.14003> | Citations: 1

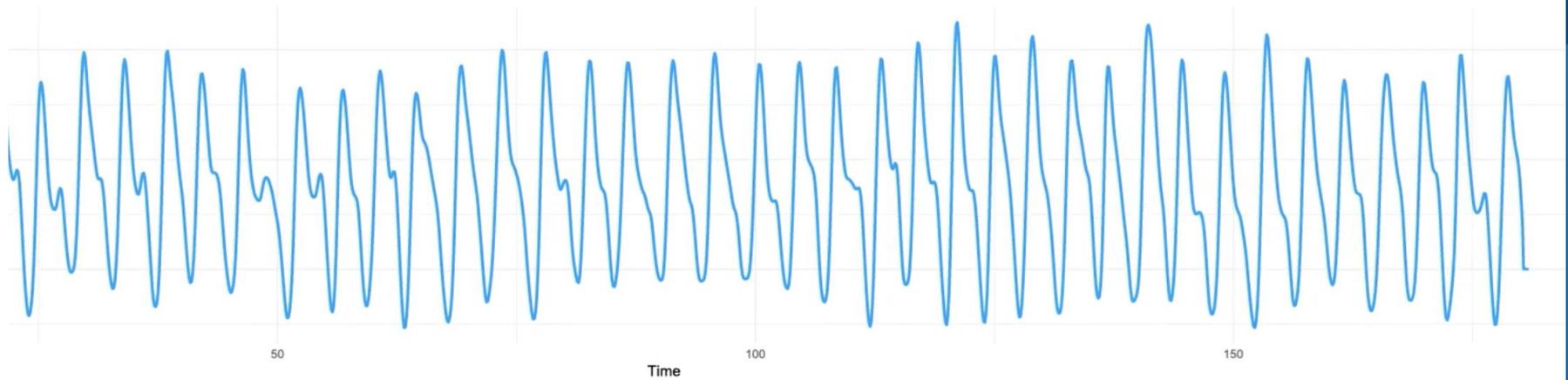
This article is part of the Special Issue: Sleep Medicine, Sleep Apnea, and Prosthodontics  
Guest Editor: Jean Wu



AI diagnosis relies on **biosensors** to detect **physiological signals during sleep**, since these signals are vital for machine learning models to **improve diagnostic accuracy**.

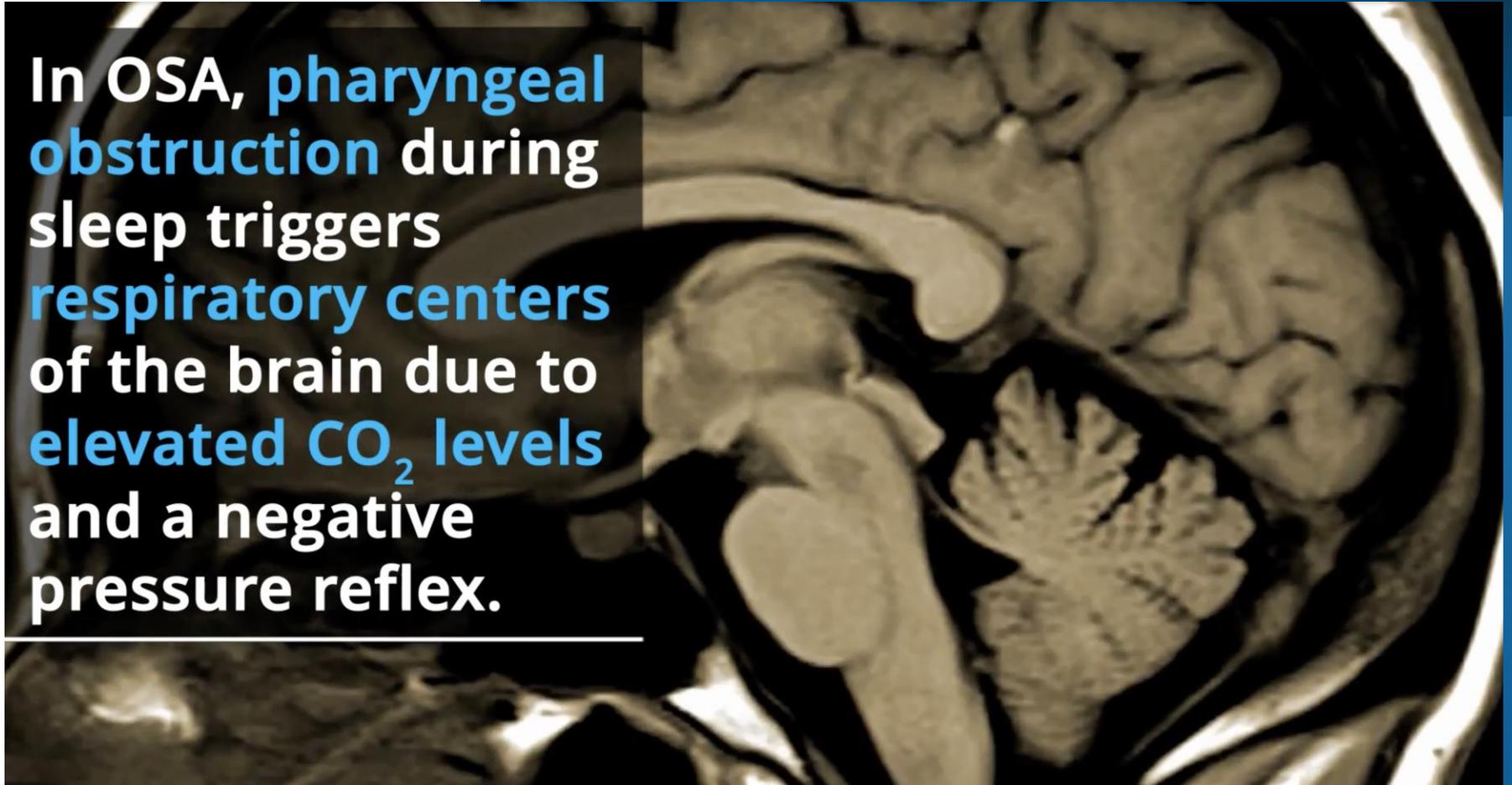
The review  
highlights MJM's  
application in  
OSA diagnosis...

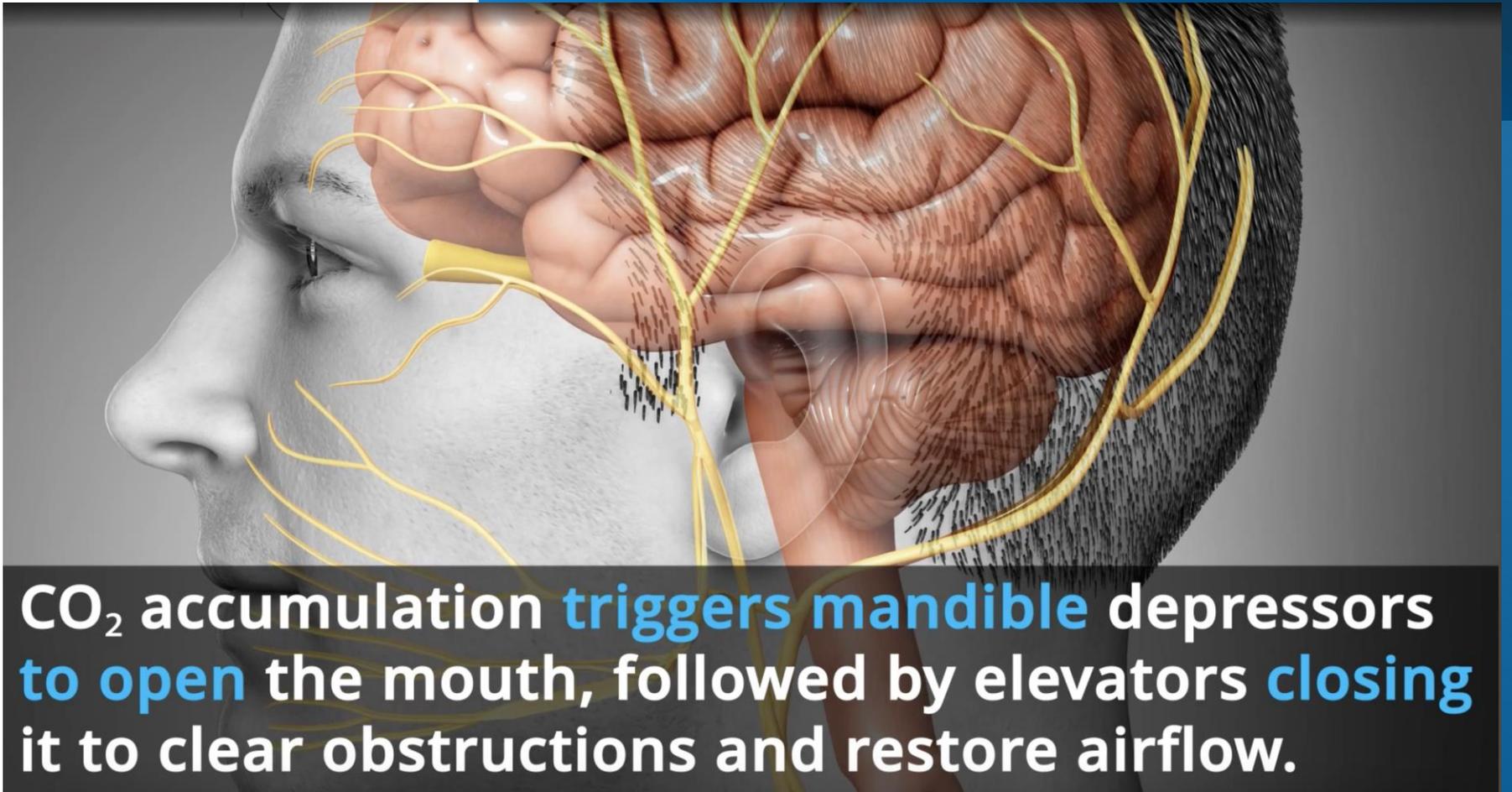




During normal sleep, the mandible moves at the **respiratory frequency**.

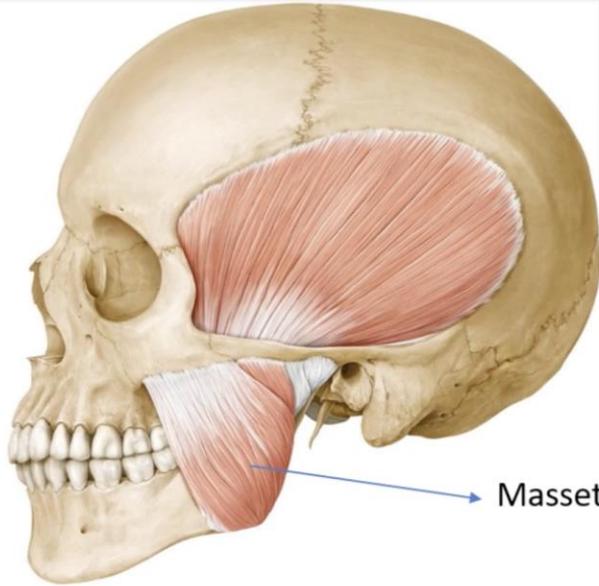
In OSA, **pharyngeal obstruction** during sleep triggers **respiratory centers** of the brain due to **elevated CO<sub>2</sub> levels** and a **negative pressure reflex**.





CO<sub>2</sub> accumulation **triggers mandible** depressors **to open** the mouth, followed by elevators **closing** it to clear obstructions and restore airflow.

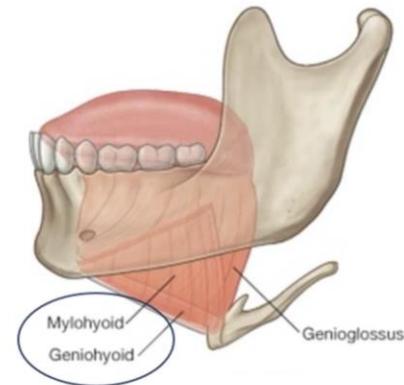
...due to **elevator** and **depressor** muscles of the jaw.



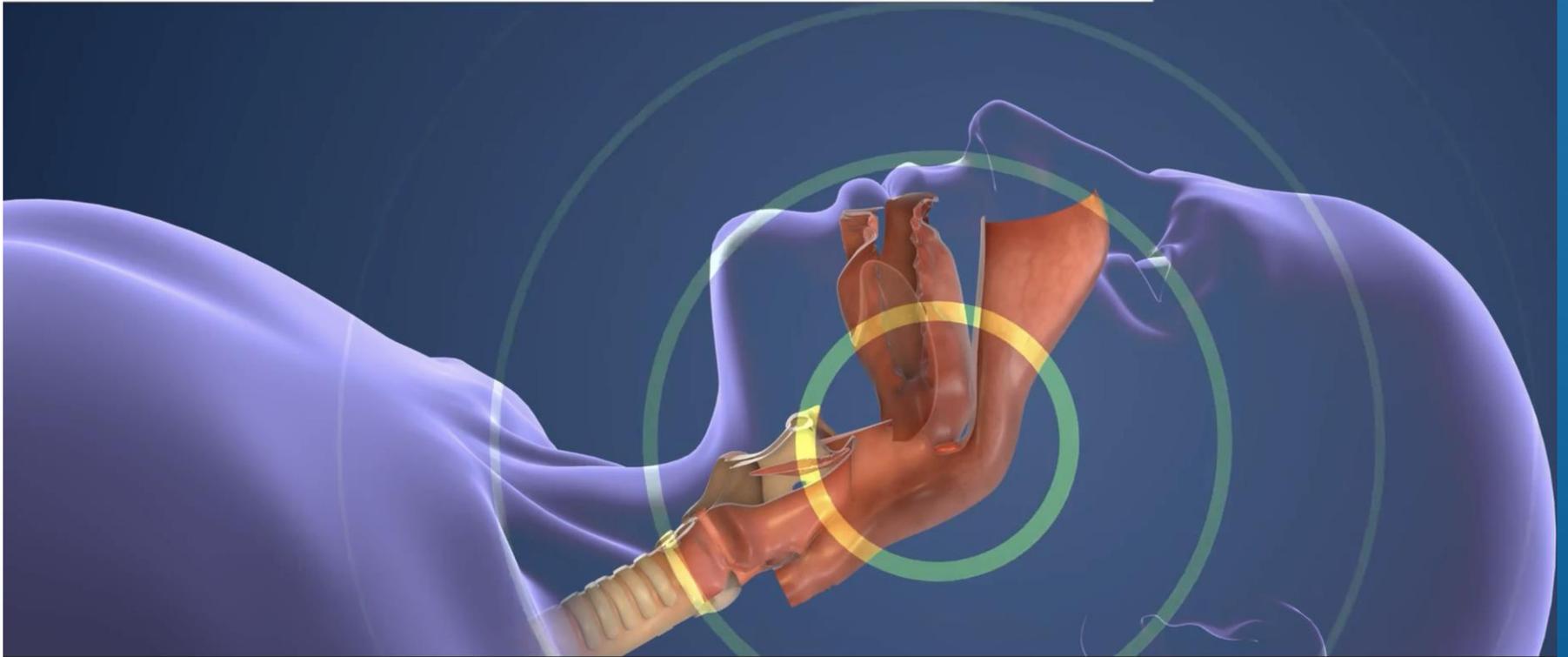
Masseter

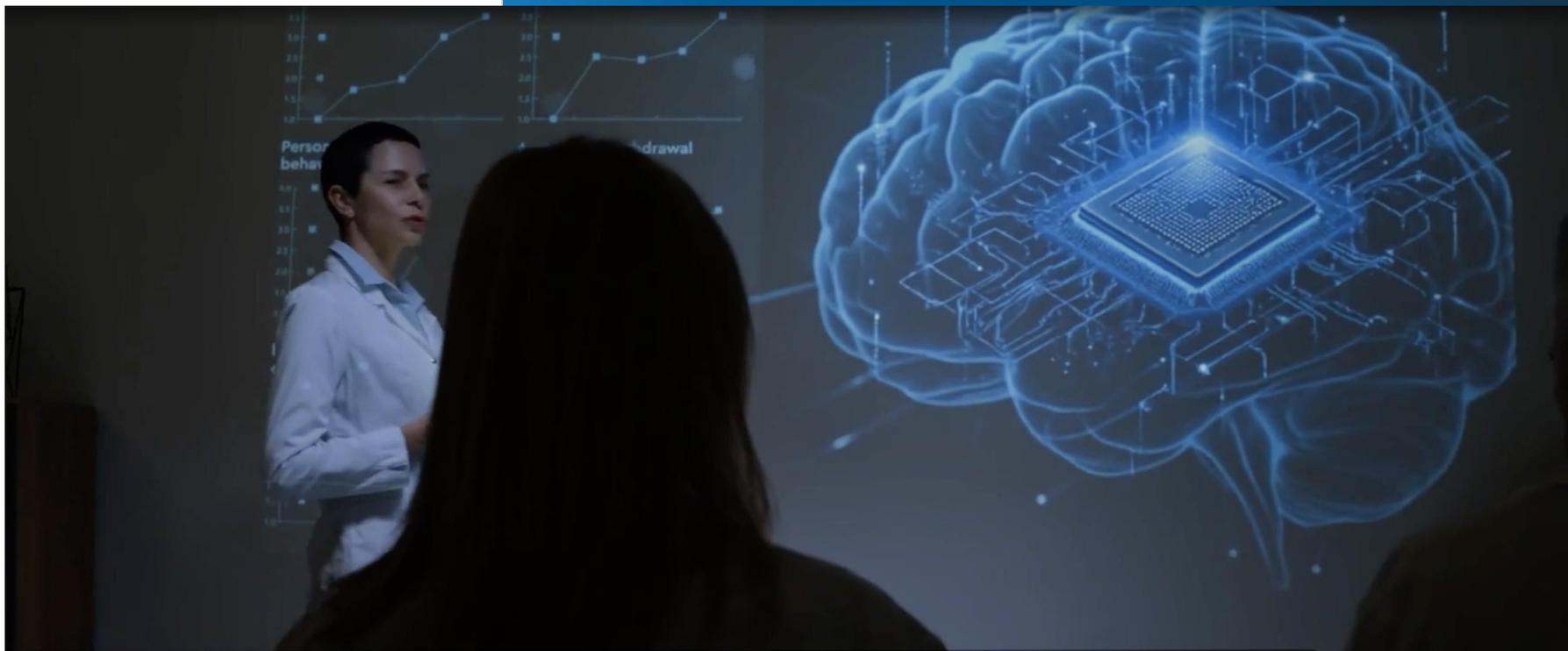
The mandible is elevated by the masseters and the anterior group of muscular fibers of temporalis muscles

The mandible is depressed by a group of muscles and mainly by mylohyoid and geniohyoid



...which maintain an open pharynx and ensure airflow circulation.





...and underscores the importance of input **signal interpretation** in both **AI** and **manual diagnosis**.

## **CONCLUSION**

An effective AI-based clinical solution should rely on signals that are easy to acquire, have a strong correlation with the underlying physiological process, and, most importantly, are straightforward and easy to interpret. Researchers are encouraged to enhance technical transparency by providing deeper insights into signal properties and to follow a comprehensive research pathway.

The MJM signal, with its intrinsic advantages, meets the criteria for ideal signal literacy. These criteria include a solid physiological foundation, good reproducibility, seamless integration with PSG manual scoring processes, and clear interpretability. Furthermore, the MJM signal has undergone rigorous research and validation at all levels, making it a model for the research and development of new surrogate biosignals. By equipping clinical practitioners with a better understanding of these technologies, we empower them to make more informed clinical decisions, ultimately improving the management of OSA.

Just one night of lost sleep can keep beta-amyloid levels higher than usual. The problem is not so much a single night's poor sleep, which you can compensate for, but a cumulative pattern of sleep loss, leading to decreases in the structural integrity, size, and function of brain regions like the thalamus and hippocampus, which are especially vulnerable to damage during the early stages of Alzheimer's disease.

Reap the many health benefits of a good night's rest, check out [\*Improving Sleep: A guide to a good night's rest\*](#), a Special Health Report from Harvard Medical School.

A serene night scene featuring a large, glowing full moon in the upper left corner. In the center, a two-story house with a porch is visible, its windows and porch lights glowing warmly. To the right, a bare, dark tree stands against the night sky. The sky is filled with numerous small, bright stars, and the overall atmosphere is peaceful and quiet. The text "NATURE SLEEP" is overlaid in the center in a white, serif font.

# NATURE SLEEP

# Sleep requirements vary with each species

- Human adults do best with 7 hours, more than 10 is detrimental with increased mortality rate
- Infants sleep an average of 18 hours/day with 50% being REM sleep



# Amoeba



Sleeps

# Sleep requirements vary with each species

- Dolphins use  $\frac{1}{2}$  of their brain at slow brain wave sleep without REM



EUGENE SANTUCCI,

VINE

Report this ad



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# Chinstrap Penguins

---

- These penguins in Antarctica fall asleep thousands times a day for 4 seconds



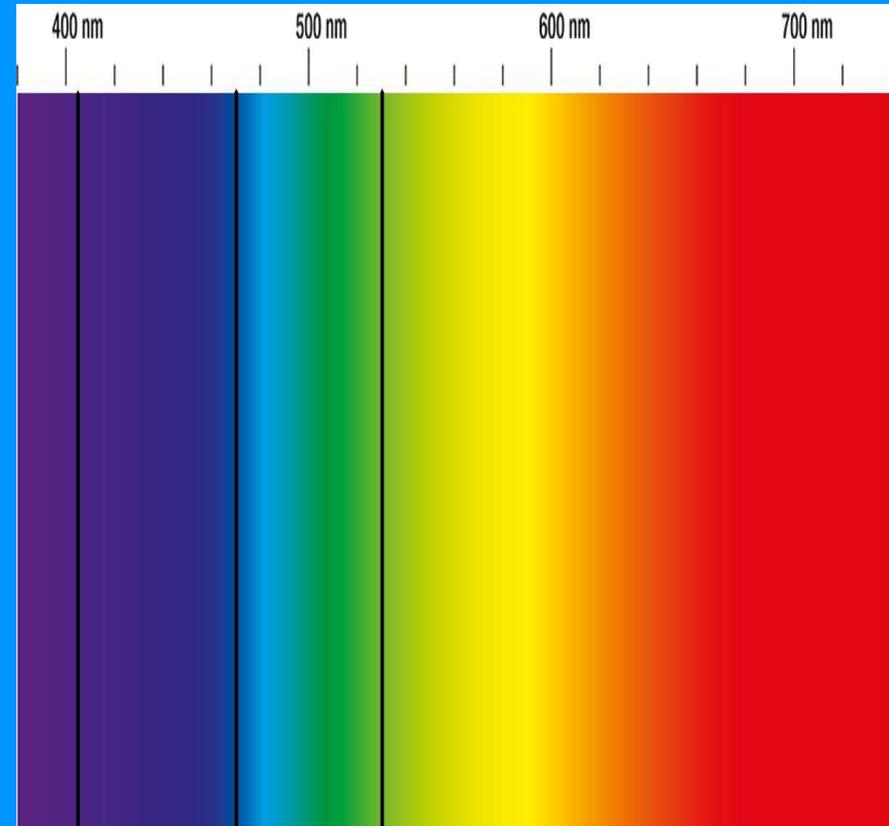
# Sleep Enforcers

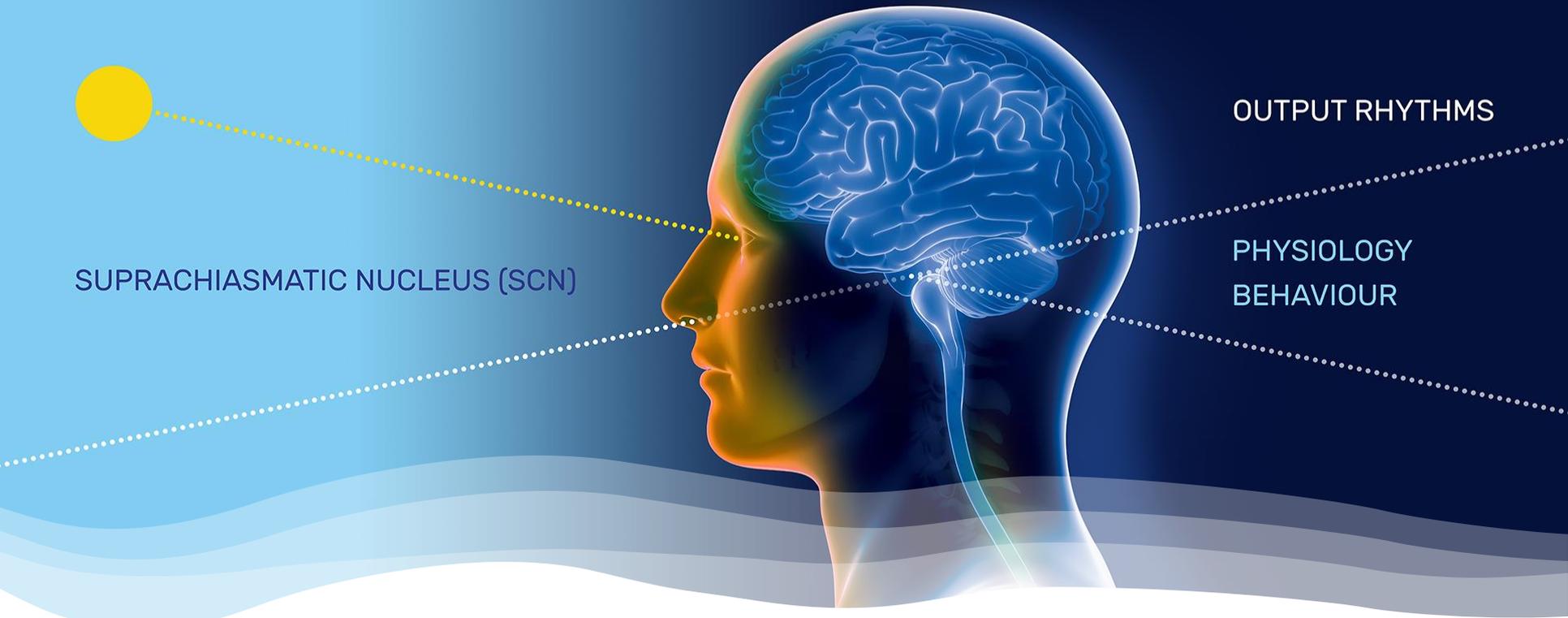
- Biological Clock , Circadian Rhythm

- Sun Light;

- AM is blue light
- Mid day is yellow light
- PM is red light

- Social Clock (watch)





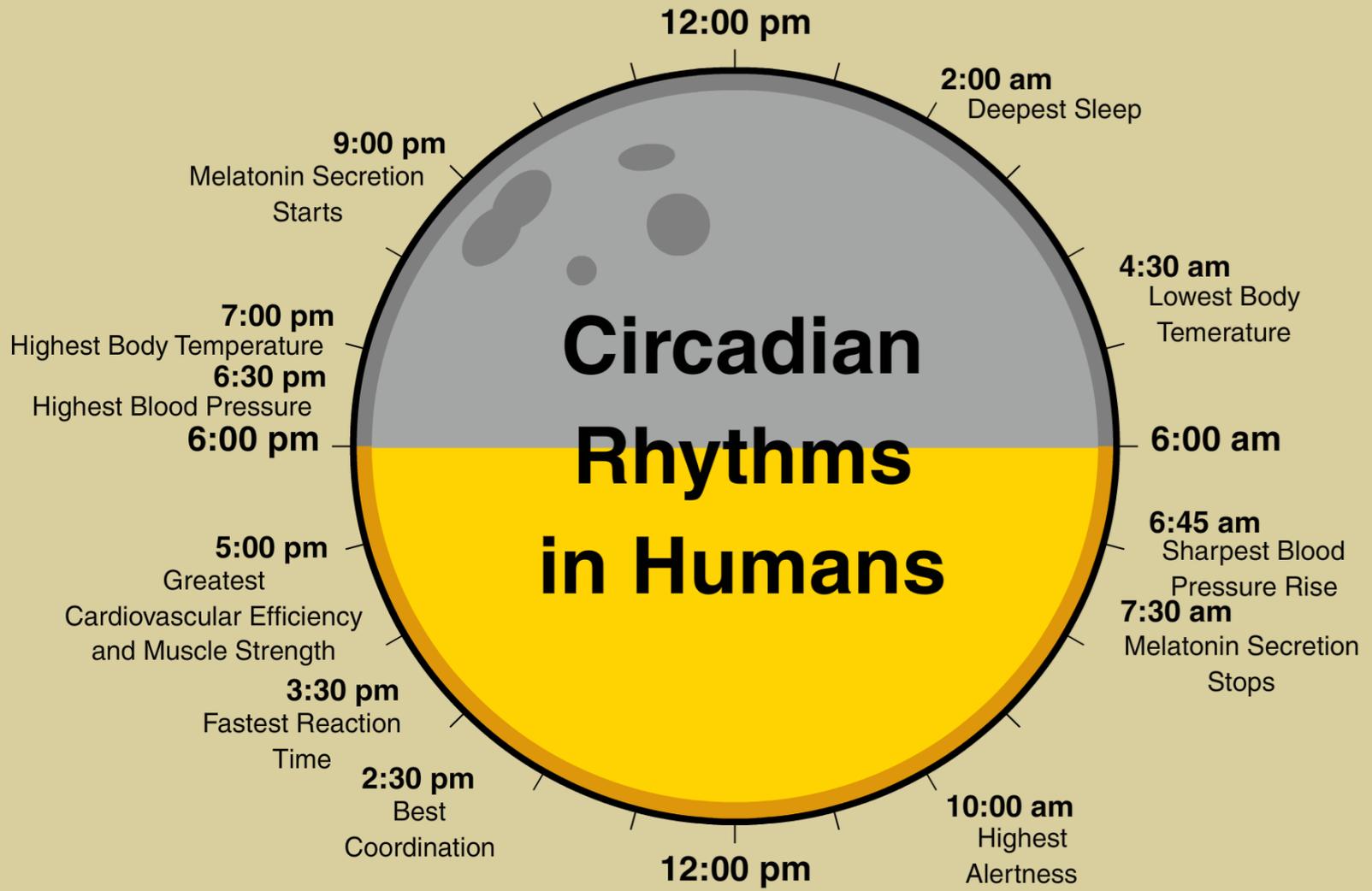
SUPRACHIASMATIC NUCLEUS (SCN)

OUTPUT RHYTHMS

PHYSIOLOGY  
BEHAVIOUR

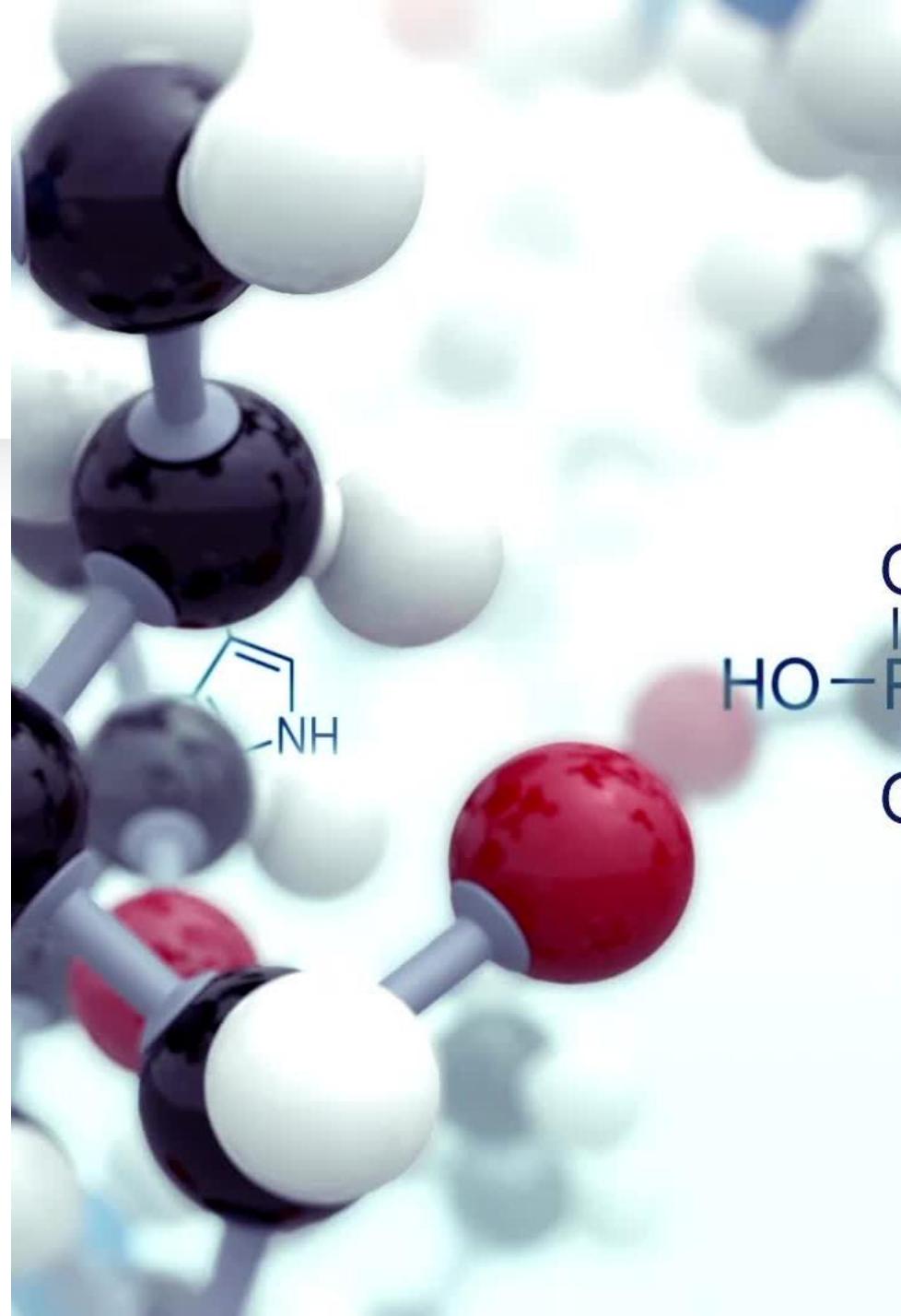
Regulates the circadian rhythm

# Superchiasmatic Nucleus



# Catecholamines

- Sympathomimetic amine compounds which are released into the bloodstream during times of physical or emotional stress.
- Dopamine, epinephrine, nor epinephrine are part of the ‘fight or flight’ response
- Increased heart rate and BP and blood glucose levels



# MELATONIN

Synthesized from tryptophan eventually to serotonin and finally melatonin



Usually secreted at approximately 9 pm, by the pineal gland in response to darkness



Reduced sleep decreases leptin production, long hours of artificial light and multiple electronic devices suppress melatonin and leads to increased eating day and night

# CORTISOL

Glucocorticoid produced by adrenal gland

Released in response to stress

Function is to increase blood sugar

Sleep deprivation increase cortisol levels

An increase in cortisol brings about a decrease in leptin levels with an increase in ghrelin, with subsequent appetite stimulation

# Sleep Pressure

- Suprachiasmatic nucleus regulates the Circadian Rhythm
- Your 24 /hr circadian rhythm is one of two factors determining wake and asleep
- Second is sleep pressure due to a buildup of adenosine which turns down the effect of wake promoting regions of the brain
- Caffeine : the most widely used psychoactive stimulant in the world blocks the adenosine effect
- Travel time changes;
  - one day per hour



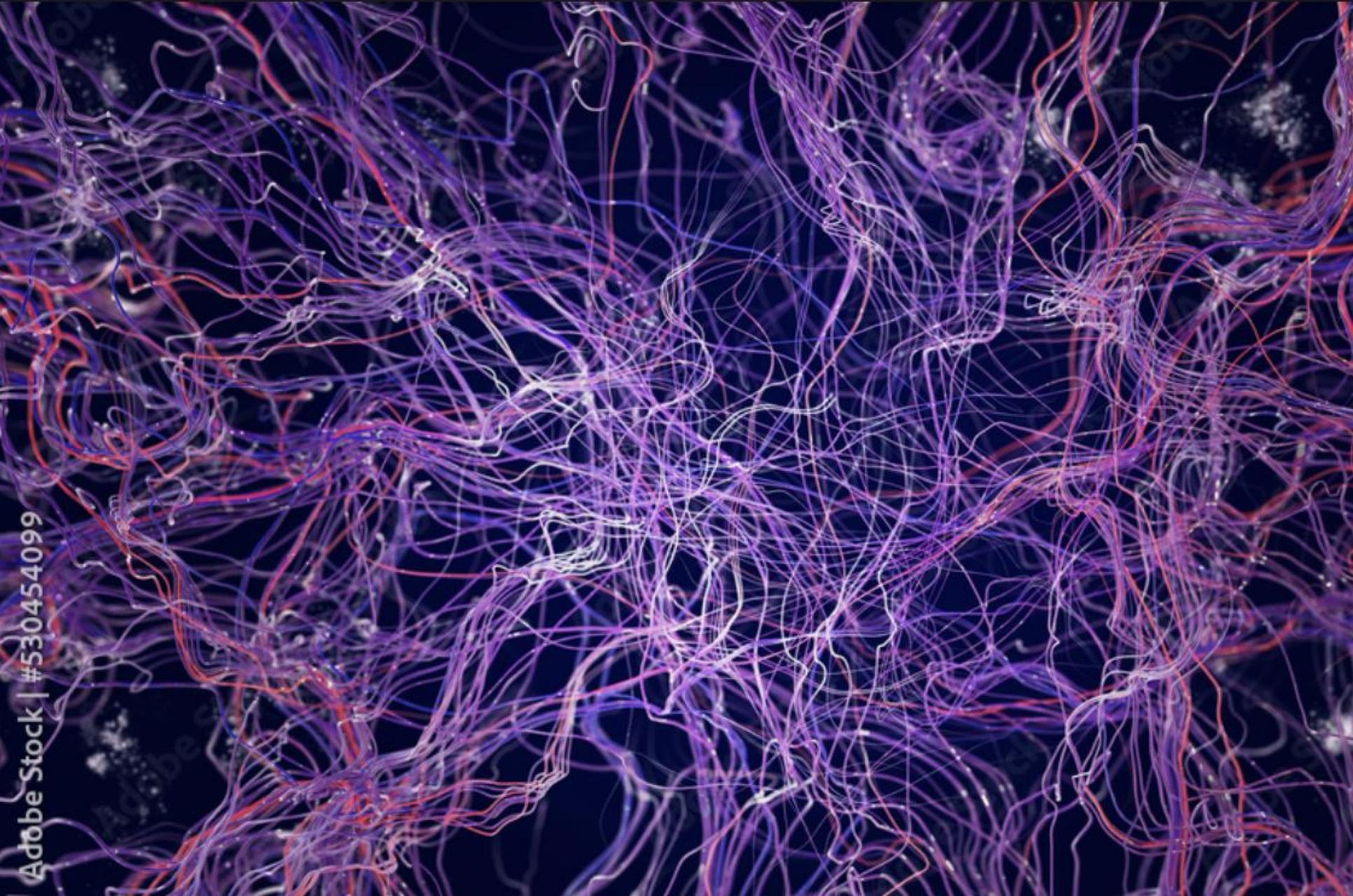


## • OREXIN

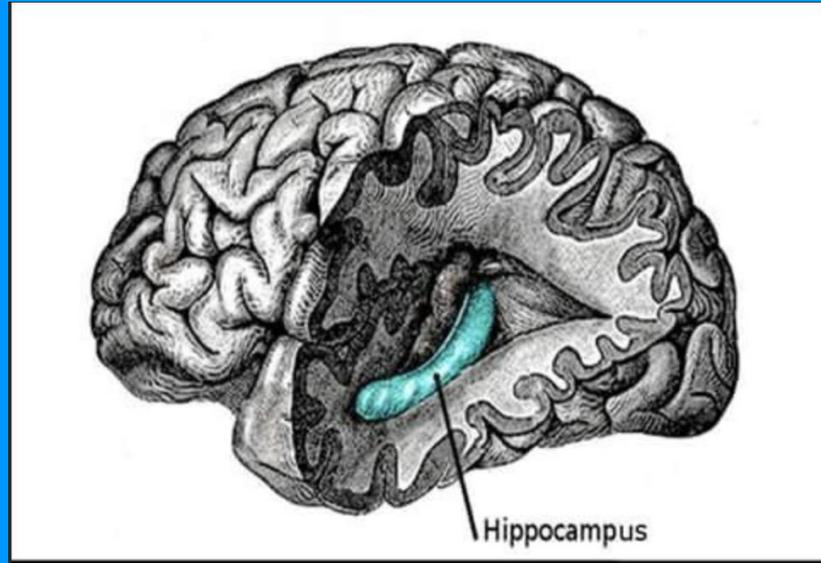
- Peptide produced in the hypothalamus
- AROUSAL, WAKEFULNESS
- Deregulates the sleep-awake cycle. Increase causes poor sleep, REM and cognitive impairment
- Receptor antagonist inhibits its effect
- Basis for most sleep meds

## • ADENOSINE

- Want's you to sleep
- Receptor sites are blocked with caffeine
- Astrocytes; may allow humans to go without sleep for longer periods of time without negative consequences/



# Hippocampus and Memory



Region of the brain largely responsible for memory formation short term to long term. Effectiveness may be lessened due to hypoxic /ischemic episodes as infants or before birth

When you blackout from drinking its because of the alcohol's effect on the hippocampus. I DONT REMEMBER ANYTHING

## The Tired Hippocampus:

Memory consolidation, the process by which information is stored following training, consists of synaptic consolidation. Sleep deprivation has a profound effect on this consolidation





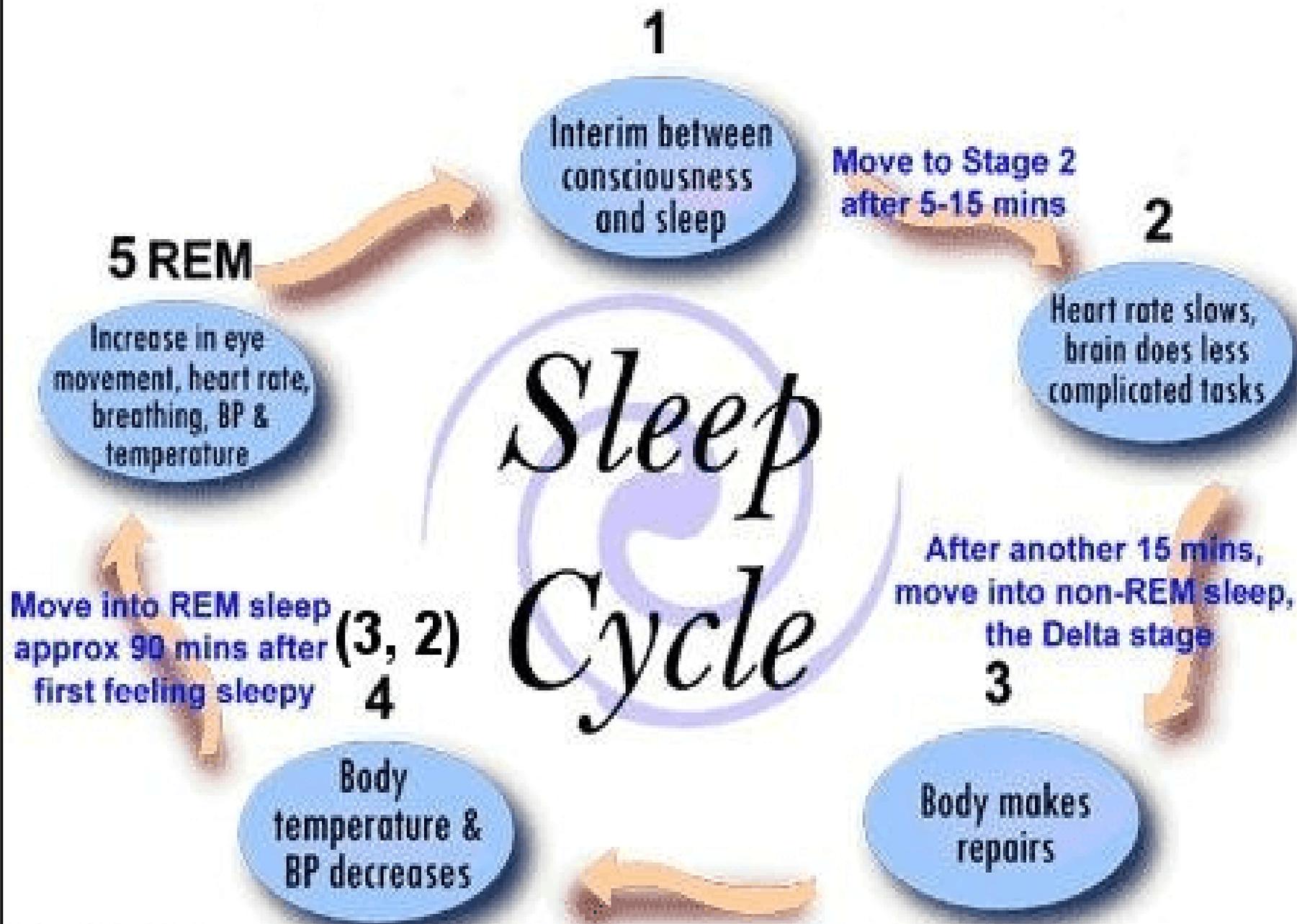
I HATE YOU,  
DAYLIGHT SAVINGS

# Daylight Saving Time is it Unhealthy?

- 65% of surveyed , do not want yearly time changes
- Research reports an increase of strokes, heart attack's and teen sleep deprivation with daylight savings time.
- Return to standard has essentially few benign effects
- Morning light sets our biological clock with possible release of cortisol whereas light later in the day delays melatonin release, big effect on teens
- WW1, WW2, 1970 thought to decrease electrical consumption, proven largely inaccurate.
- Beth Malow MD, Phd. Sleep Health 2022



# Sleep Cycle



BP = Blood Pressure

# Dreams May Predict the Future

Jun 3, 2024 | Brain | 0 | ★★★★★



A new study finds that while some neurons replay past events during sleep, others surprisingly anticipate future experiences, potentially explaining how dreams can sometimes predict the future

**Summary:** A new study reveals that some neurons in the brain not only replay past events during sleep but also anticipate future experiences, which may explain how dreams can sometimes predict the future. This research, published in Nature, involved observing individual neurons in the hippocampus of rats during rest after navigating a maze. The study utilized a novel machine-learning approach to track the spatial tuning of neurons, discovering that while many neurons stabilize memories during sleep, others adapt to anticipate future experiences, highlighting significant neuroplasticity during sleep.



## APNEA – HYPOPNEA INDEX

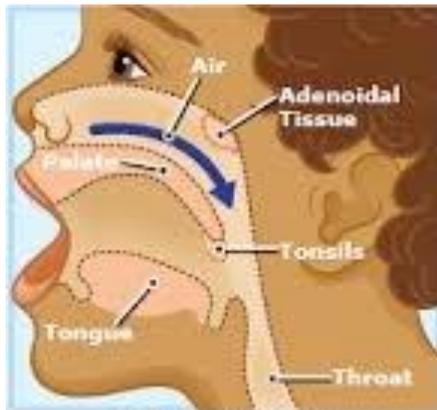
- Apnea; breathing cessation with decreased air flow of 70% or greater for 10 seconds or more
- Hypopnea: reduced breathing by 30% or more lasting 10 sec or more with O<sub>2</sub> desaturation of 4% or greater
- Number of Apneas plus Hypopneas per hour defines the AHI (Apnea-Hypopnea Index)
- 5-15 moderate, 15-30 plus, severe



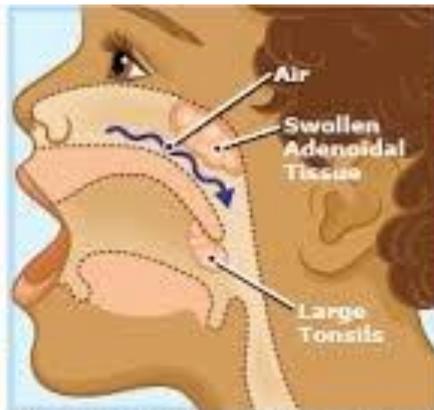
POW' LACK OF REM CYCLE  
S

# Sleep Disturbed Breathing

Snoring → UARS → OSA



**Normal Anatomy**  
Open airways allow air to flow easily.



**Common Causes of Sleep Apnea**  
Large tonsils and adenoids make airflow more difficult.



SCOTT CAMAZINE/ALAMY

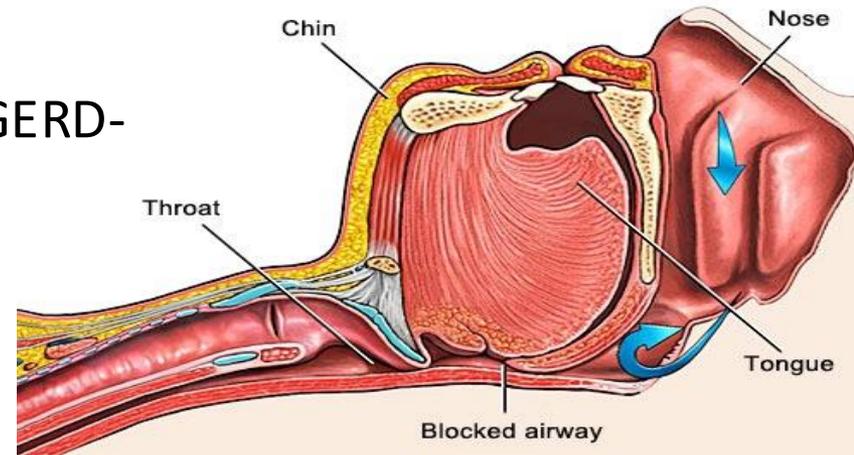
UARS → ↑Resp. effort → ↑arousals

Bonuck K, Pediatrics. 2012;(4):e857-e865

# Sleep Disturbed Breathing

## Snoring → → OSA

Upper airway resistance also related to GERD-  
vacuum created



OSA → Hypoxnia → ↑ HeartRate → RMMAs → GE  
RD → SB





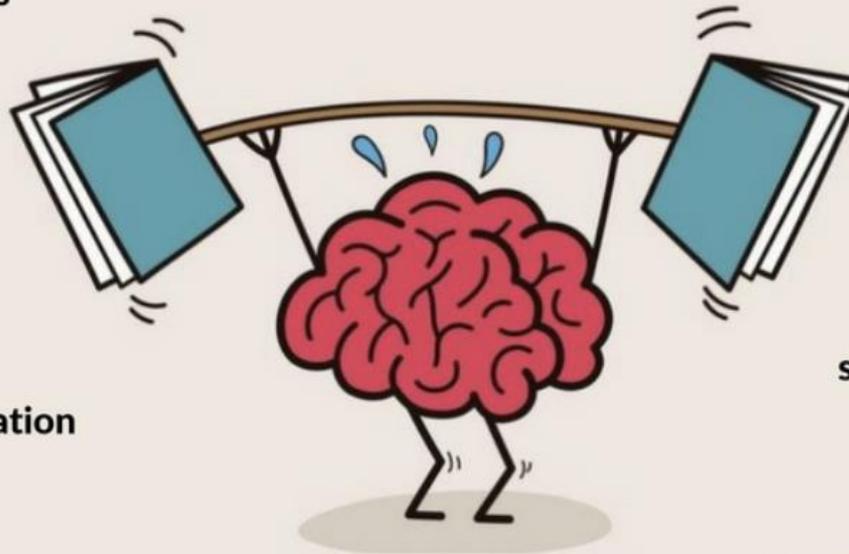
# HOW LACK OF SLEEP AFFECTS YOUR BRAIN

You mix up words  
and stutter

The risk of getting  
cold increases

Your concentration  
worsens

You become irritable

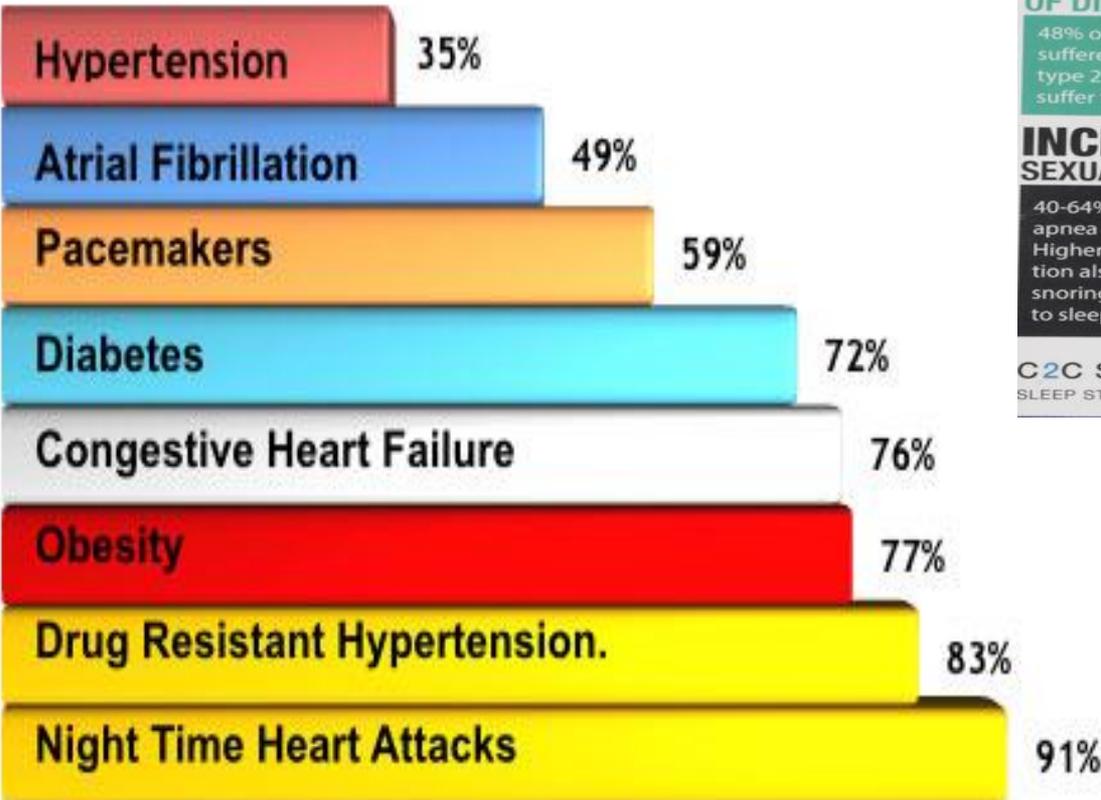


A lack of sleep can  
damage brain tissue

You'll want to eat  
something all the time

Your brain can't filter  
out surrounding stimuli

## Diseases Associated with OSA



# SLEEP APNEA

AFFECTS YOUR WHOLE BODY

### HIGHER RISK OF DEPRESSION & ANXIETY

People with depression are five times more likely to suffer from sleep apnea, in addition to insomnia and poor sleep.

### IMPAIRED COGNITION

Sleep deprivation slows average Reaction Time by up to 30% and increases attention lapses by 150%.

### HIGHER RISK OF DIABETES

48% of type 2 diabetes sufferers and 86% of obese type 2 diabetic patients suffer from sleep apnea.

### INCREASED SEXUAL PROBLEMS

40-64% of males with sleep apnea have erectile dysfunction. Higher rates of sexual dysfunction also found in families. Loud snoring can force bed partners to sleep in separate rooms.

### HIGHER RISK OF STROKE

65% of stroke patients have sleep apnea.

### HIGHER RISK OF HEART DISEASE

40-83% of patients with hypertension have sleep apnea. Studies show sleep apnea increases your heart rate and blood pressure.

### WEIGHT GAIN

Lack of sleep (5 hours per night) can cause snacking and weight gain of about 2 pounds in under 1 week.

### HIGHER RISK OF CAR ACCIDENTS

36 percent of people drive drowsy or fall asleep while driving.



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www.c2c-diagnostics.com

# SNORING

“LAUGH AND THE WORLD LAUGHS WITH YOU

SNORE AND YOU SLEEP ALONE”



# Are You Awake

One person dies every hour in a traffic accident due to fatigue, greater than deaths from alcohol and drugs combined.



SF Chronicle Feb 7-18

NATION



Mark Lennihan / Associated Press 2017

An injured passenger is taken from a Brooklyn terminal after a Long Island Railroad train crashed last year, killing one person and injuring some 200.

TRAIN ACCIDENTS

## Crashes blamed on lack of apnea testing

**Should we be concerned?**



## Insomnia

- Persistent problem with falling and staying asleep
- Etiology;
  - poor sleep habits
  - depression
  - anxiety
  - chronic illness
  - lack of exercise
  - medications



## Insomnia

- Over 3 million cases per year in US
- Treatment can help but not a cure;
- sedatives
- antihistamines
- antidepressants
- In general, caffeine and nicotine are stimulants where as alcohol relaxes throat muscles.

# Can't We Just Take A Pill



Viola!



# MARINOL®

(dronabinol)

Capsules 2.5 mg, 5 mg, 10 mg



**UNIMED**  
PHARMACEUTICALS, INC.

A Solvay Pharmaceuticals, Inc. Company



COULD A  
CANNABINOID PILL  
TRANSFORM SLEEP  
APNEA  
TREATMENT?



shutterstock.com · 1194315088

New research using cannabinoid anti nausea treatment helped to improve some sleep related factors related to OSA.

David Carley and Phillis Zee ran double blind, two center, randomized, placebo controlled studies

Inclusion criteria: BMI <45, Epworth >7 and AHI 15-30, PSG reported

Dosage, 1 hour before bedtime

Dronabinol (Marinol) 2.5 mg, 10mg,  
placebo

Test duration; 6 weeks, PSG every 2 wks

Epworth questionnaire every 2 wks

Licensed Intellectual property. Respire PHM

Federal grant, PACE,

# Study Results

Epworth scale: no change with the placebo or the 2.5 mg, but a -4.0 change with 10.0mg

10 mg dose , decreased frequency of AHI

improved subjective sleepiness

increase in treatment satisfaction

No change in amount of sleep or objective sleepiness

# Journal of Clinical Sleep Medicine

21 % reported improvements in sleep

with cannabis products

-48% reported worsening sleep

-14% reported mixed results

-17% reported no impact at all

-middle of night awakenings when taken for  
other medical reasons

# CBD OIL

- Derived from Hemp
- Cannabidiol, non psychoactive part of weed
- Patents exist on some of it's healing effects
- Inflammation, chronic pain, joint aches, arthritis, anxiety, stress, depression, PTSD, insomnia, decreased nausea and vomiting, decreased seizures, fights cancer cells, offers diabetic support



# 'Seek Medical Advice Before Giving Melatonin to Children,' Says AASM

Sep 22, 2022 | Over-the-Counter Treatments | 0 | ★★★★★





# NightLase Snoring and Apnea Treatment

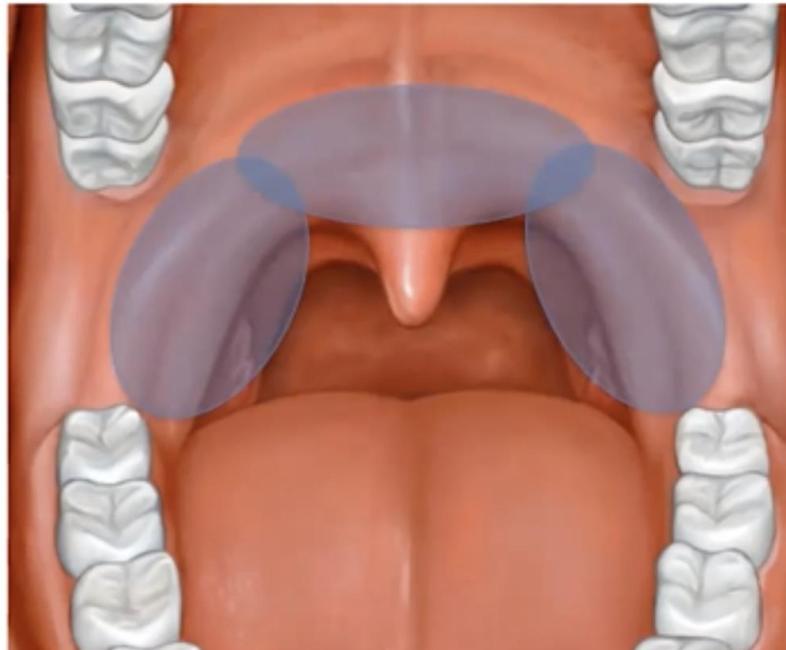
Er-YAG laser.

Non anesthesia use, heats the tissue causing tightening of the tissue which leads to attenuation of sound.

Three separate treatments over 6 week period



## Target Areas

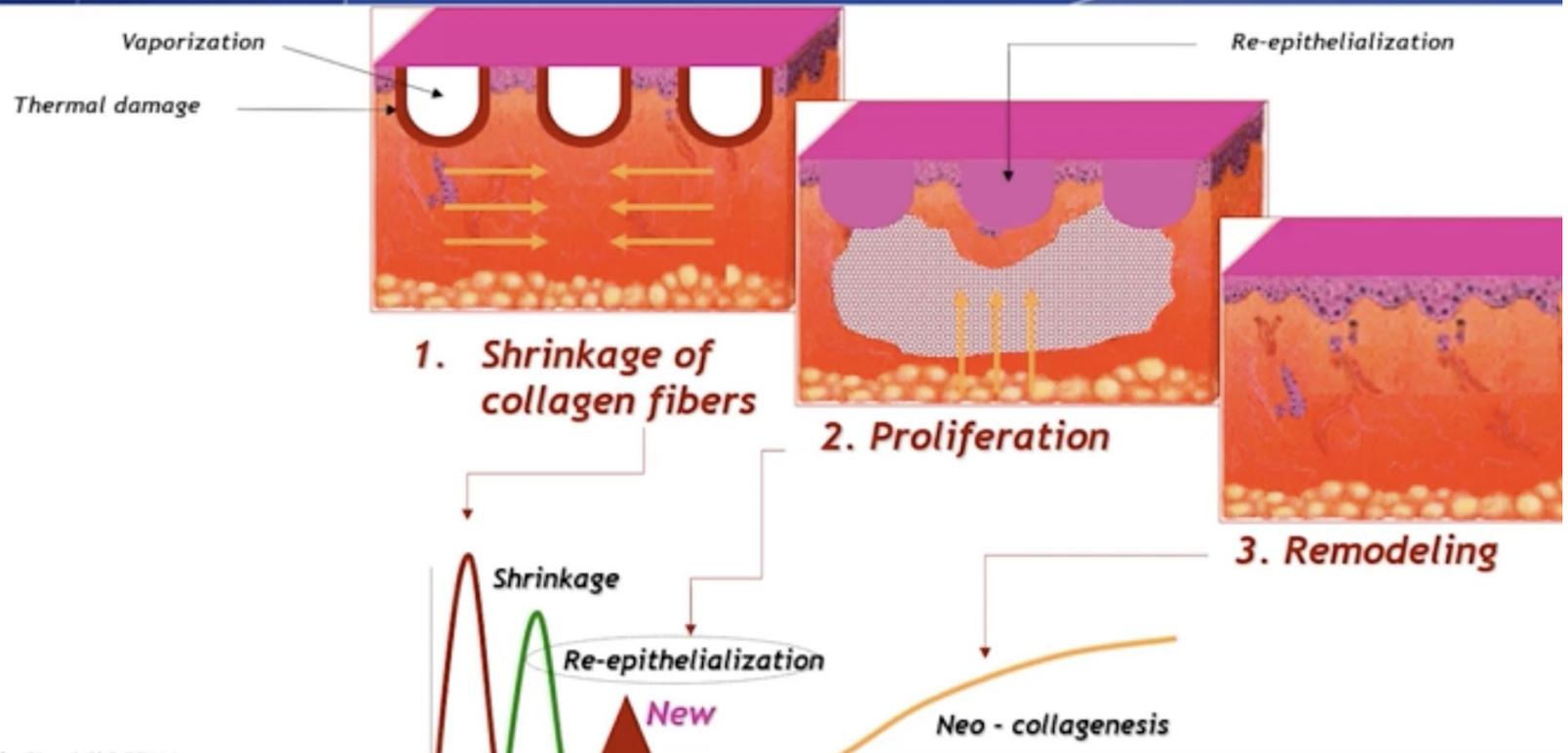


# Fractional Ablation Treatment

## How the tissue heals with fractional CO<sub>2</sub>

1. The cells in the basal layer of the mucosa respond quickly and begin proliferating and migrating to cover the site of injury. (Initial surface tightening effect)
2. If the surface of the mucosa is ablated over an extensive area, then you must rely on the adnexal structure (lamina propria or adjacent epithelial cells) to produce transient amplifying cells (baby mucosal cells) to replenish the epithelium.
3. The denatured collagen activates the fibroblasts, which in turn manufacture new collagen and elastin fibers resulting in a nearly normal configuration. Collagen remodeling continues to occur to 3-6 months after laser resurfacing.
4. Results can last 12-18 months

# Collagen Shrinkage → Neocollagen



## Tonsillar Decontamination Results

Before

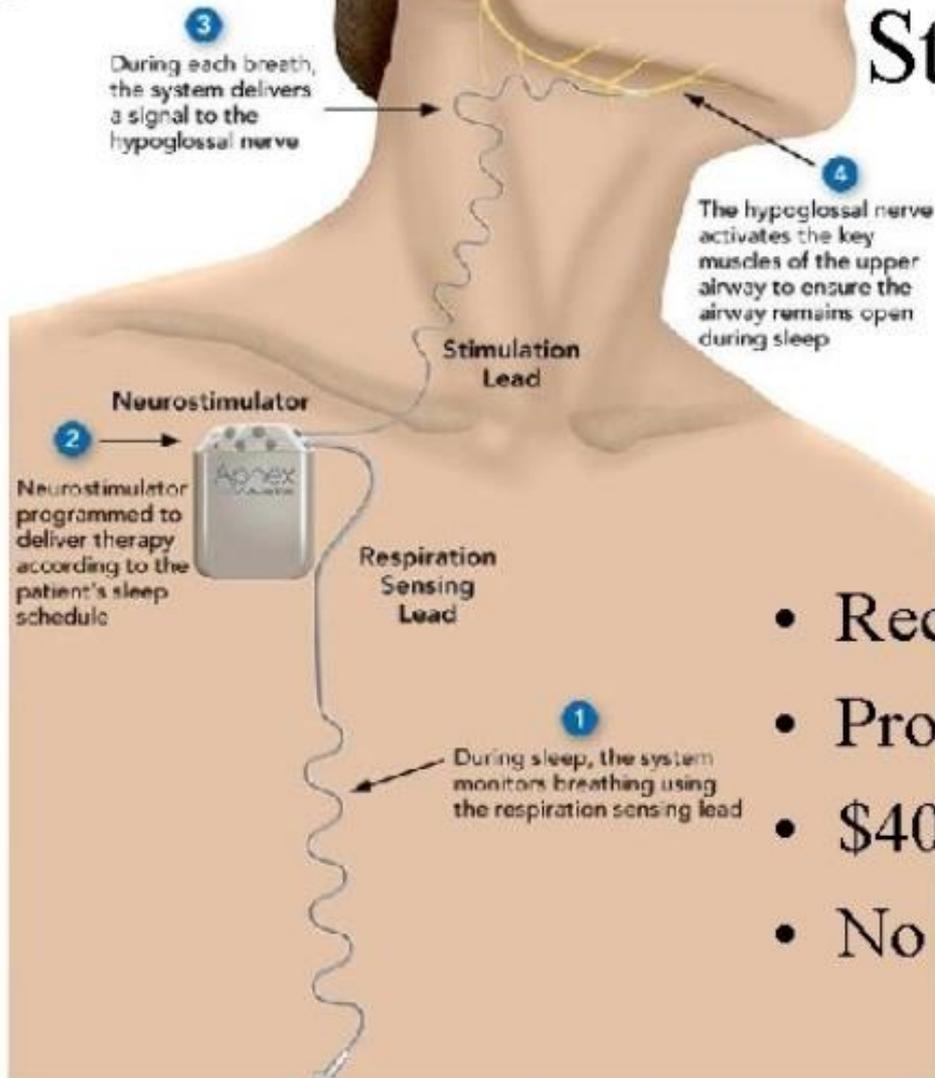


After





# Hypoglossal Nerve Stimulator



- Recently FDA approved
- Propofol Endoscopy
- \$40,000
- No long term data

## QUIZ

**What is the primary function of hypoglossal nerve stimulation in the treatment of obstructive sleep apnea?**

A. To regulate heart rate during sleep

B. To stimulate muscle tone in the throat

C. To enhance REM sleep

D. To reduce snoring

[Take the Quiz](#)

# Hong Kong Sleep Bus



- People in Hong Kong don't have enough time to sleep, many were sleeping on public transit
- Their apartments are small and noisy
- Kenneth Kong saw this as an opportunity to develop the 5 Hour sleep tour
- 50 miles with some scenic stops if you wish to get off

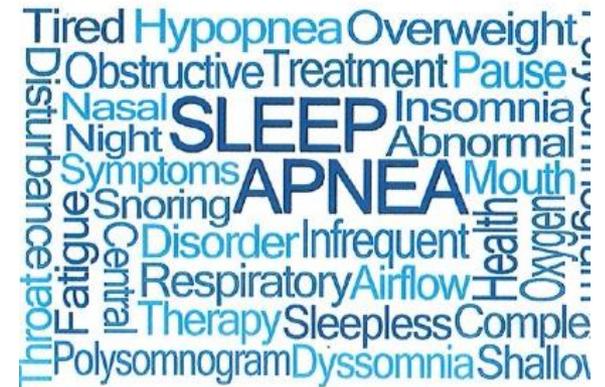


## Sleeping on the Job: The Rise of Nap Pods

- The Pods enclose the user in a bubble of silence or tranquil music at a position that promotes relaxation while isolating them from seeing what's happening outside

# Buteyko Method

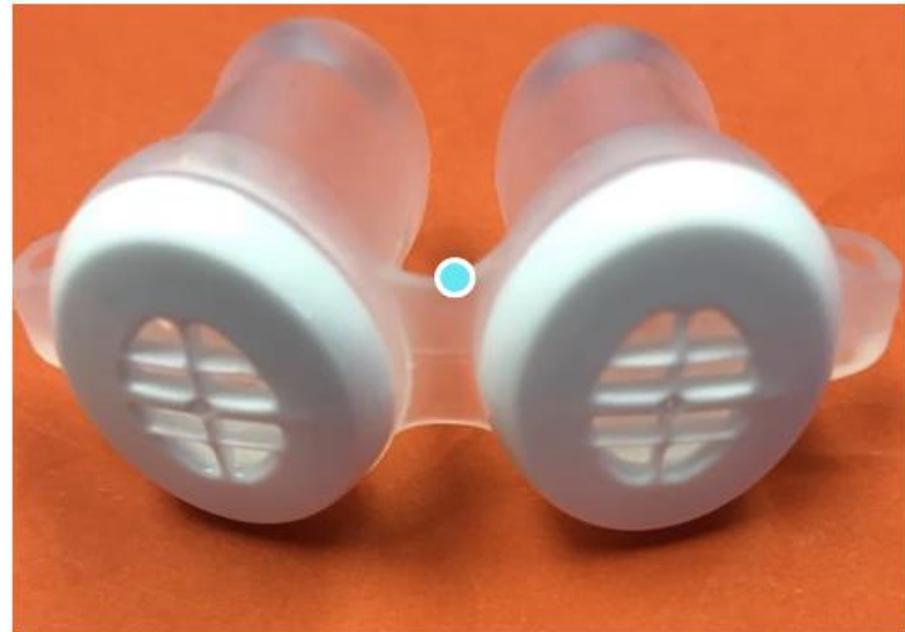
- Konstantin Buteyko, Soviet Md. 1950's
- Form of complementary or alternative therapy that uses breathing exercises as a treatment for asthma and other respiratory conditions.
- Asthma is exacerbated by chronically increased respiratory rate or hyperventilation
- Hyperventilation results in decreased CO<sub>2</sub> (hypercapnia) which changes the acid/base balance in blood and tissue O<sub>2</sub> levels.
- Stress activates the sympathetic nervous system resulting in shallow rapid breathing
- Method;
- Nasal breath in 4 sec---hold 7 sec--release 8 sec



# BONGO RX

## EPAP (Expiratory Positive Airway Pressure)

As you exhale, the valves at the bottom of your Bongo Rx will close. This directs exhaled air through vent holes to generate EPAP, which keeps your airway open until you breathe in again.



# Inemuri

## Present While Sleepng

- In Japan this practice is widely accepted and even encouraged
- Inemuri: being present while asleep is common and viewed as a sign of a hard worker
- Recent study; 40% of Japanese adults sleep less than 6/hre/night



- Mouth Tapeing



Portrait of adorable little girl with adhesive tape over her mouth. Little girl with no voice, freedom of speech or forbidden opinion concept. Studio portrait of the little girl with adhesive tape over her mouth. Little girl with no voice, freedom of speech or forbidden opinion concept. Mouth Stock Photo



# didgeridoo



# What's Going On?

- 2/3 of the worlds population exhibit disturbed sleep patterns
- Vehicle deaths attributed to disturbed sleep are greater than those from alcohol and drug abuse combined
- What's going on... we're fatigued and so are our patients
- Should we be concerned?
- Should our practice be concerned?
- Gate keepers



# Co-morbidities from Sleep Disordered Breathing

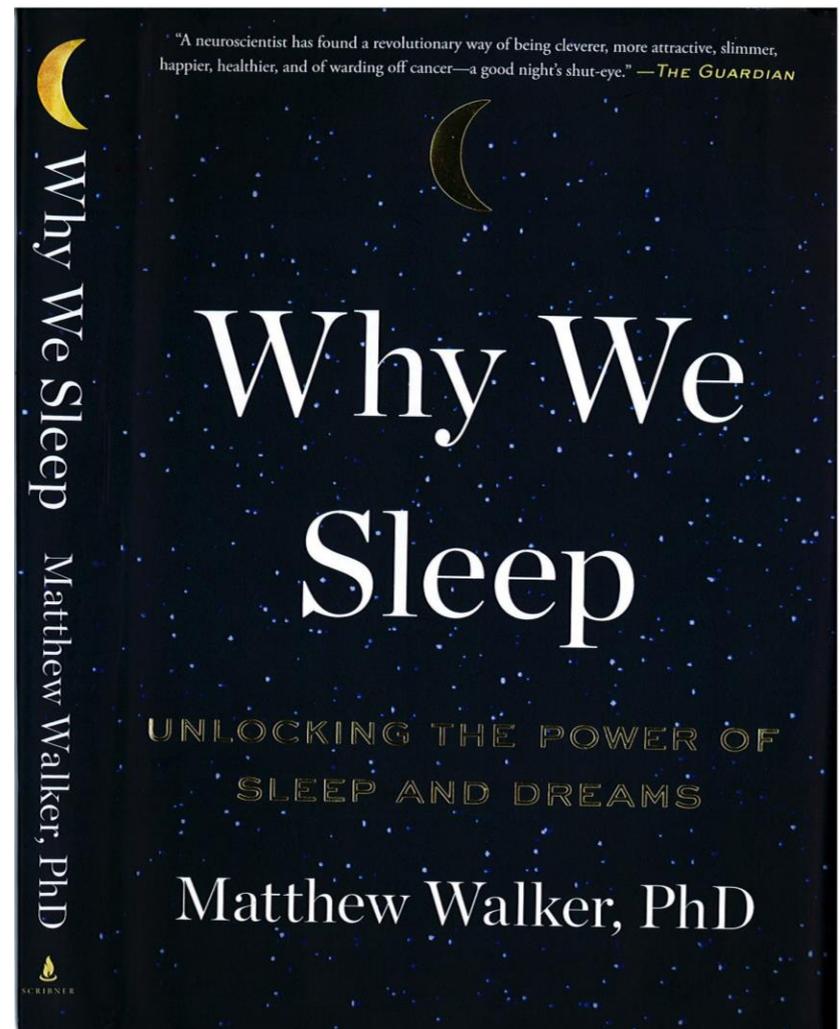
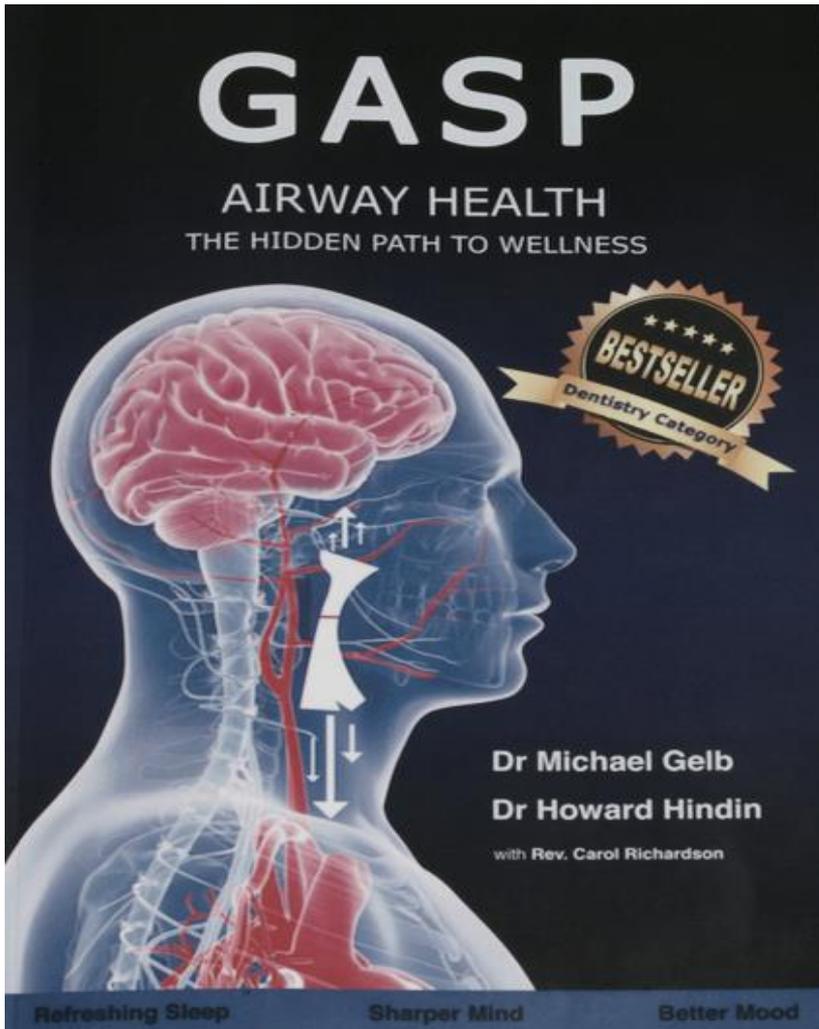
- Headaches, snoring, difficulty sleeping
- Jaw, or ear pain ,neck pain or stiffness
- Sugar cravings, junk food cravings
- Obesity, diabetes
- Cardiovascular disease
- Difficulty focusing mentally
- Excessive daytime sleepiness, low energy
- Wake up feeling unrefreshed

# Why We Sleep- Did Evolution Make a Mistake?

- One of the last great biological mysteries of our times
- In the PAST, great minds struggled with this need
  - Francis Crick- developed the helix composition of DNA
  - Freud-Psychological merits of sleep
  - Quintilian-Roman Rhetorician-Relationship of sleep to learning and memory



Why We Sleep.  
By Mathew Walker



## Advisor

Mar 16, 2025 | Skin | 0 | ★★★★★



Estée Lauder has signed Matthew Walker, PhD, as the brand's first-ever global sleep science advisor, leveraging his expertise to deepen Estée Lauder's nighttime skincare research and innovation, while tapping into the global sleep movement to educate consumers on the vital connection between sleep and health.

# Evolution Does Not Make Mistakes

Every 24-hours sleep benefits us in two ways:

## Nurtures the Brain

1. Helps us to
  - Memorize facts,
  - Learn,
  - Make logical decisions and choices,
  - Recalibrates our emotional circuits
2. Dreams encourage a
  - Neurochemical bath that soothes painful memories,
  - Improves creativity
  - Encourages short term memories to long-term



# GLYMPHATIC SYSTEM CLEANING UP THE BRAIN



Special nervous system cells sweep in to scavenge additional waste.



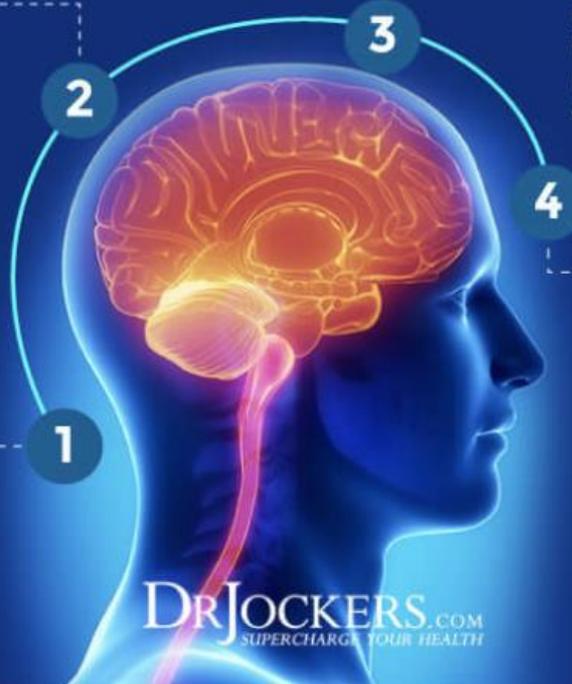
The glymphatic system flushes out dirty fluid and molecules from inside the brain tissue through a network of pathways. Clean cerebrospinal fluid replaces it.



Brain cells perform autophagy ("self eating"), mopping up diseased and damaged bits of protein and metabolic waste.



Lymphatic vessels surrounding the brain deliver the waste to the lymphatic system, which rids the body of toxins, waste and other unwanted material.



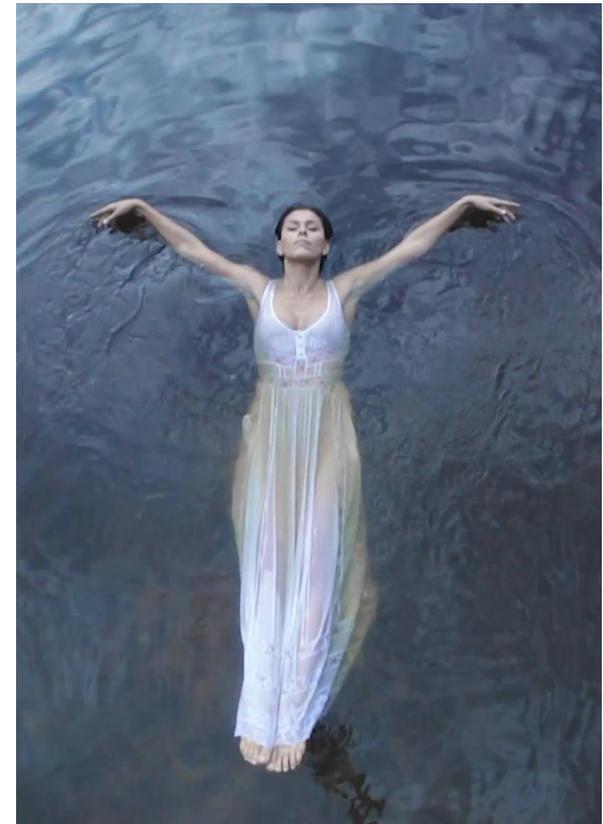
DRJOCKERS.COM  
SUPERCHARGE YOUR HEALTH

# Evolution Does Not Make Mistakes

Every 24-hours sleep benefits us in two ways:

## Nurtures the body

1. Helps our immune system to fight off malignances
2. Balances insulin and floating glucose
3. Controls appetite
4. Balances gut bacteria
5. Exhibits a positive effect on CVD and heart health



*Try New Things*



*Learn a new language*



*cloud*



# *Interesting Brain Exercises*



*Interact with different people*



*Listening to good music*

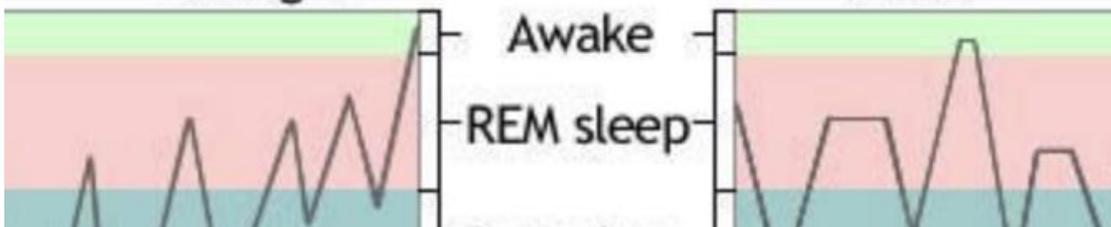


# Sleep Apnea Accelerates Aging



Younger

Older



- Age acceleration testing involves a blood test that analyzes DNA and uses an algorithm to measure a person's biological
- age

A person's biological age surpassing their chronological age is called “epigenetic age acceleration” and is linked to overall mortality and chronic disease

- C-PaP use decelerated the epigenetic age
- U. Missouri School of Medicine, Cortese MD

# Smoking// Vaping

Smokers experience 50% increase with troubled sleep than non-smokers.

- take longer to fall asleep
- wake up more often
- sleep fewer hours
- spend increased time in lite sleep



# Possible to Prevent/Reverse Dementia?

- The brain is like a roof with 36 holes in it, you must patch them all to stay dry.
- Dr. Dale Dresden . Aging 6:9 204-207
- Reversal of Cognitive Decline. A novel Therapeutic Regime.



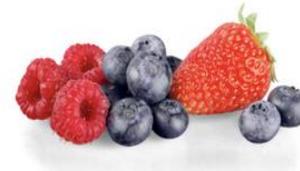
# HOW ??

- Decrease inflammation
- Control blood sugar
- Improve nutrition
- Decrease life stress
  
- 90% success rate

## INFLAMMATION FIGHTING FOODS

(Chronic inflammation has been linked to heart disease, diabetes, cancer, and Alzheimer's.)

@BodyBloom



Fasting drives the body to switch between burning glucose (carbohydrates) for fuel and using stored fat for energy in a similar way that exercise does. When blood glucose levels are raised, insulin levels will be elevated which prevents us using our fat reserves for energy.

Studies have shown IF can support cardiovascular health, reduce inflammation, combat obesity, and enhance brain function. (2)

It takes on average at least 12 hours of continuous fasting for the health benefits to trigger and for the body to switch to a fat burning state. Regimes that promote this metabolic switch have the potential to help reduce weight in obese individuals and for those of normal weight to improve their energy and overall health.

Several methods of IF regimes exist with periodic fasting being the most popular and easiest regime to follow. IF permits an 8-hour nutritional window in which to consume foods followed by 16 hours of fasting.



# Surprising Links Between Gut Health and Sleep Apnea

May 2, 2025 | Obstructive Sleep Apnea | 0 | ★★★★★



## Circadian Disruption May Accelerate Colorectal Cancer by Altering Gut Microbiome

Sep 30, 2024 | Circadian Rhythms | 0 ● | ★★★★★



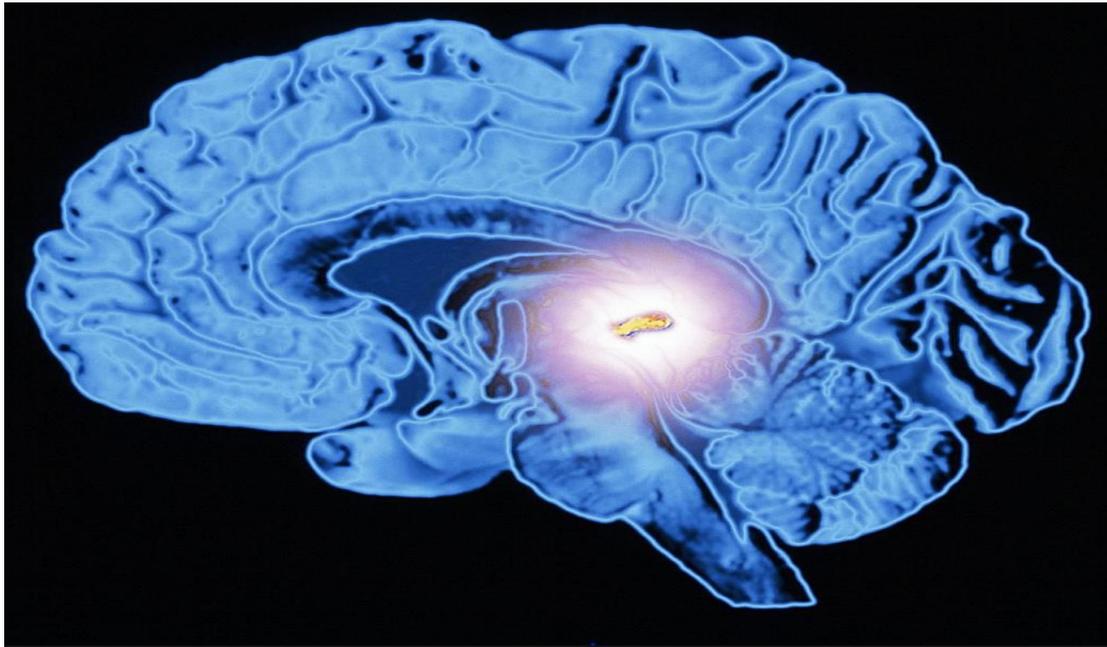
A University of California, Irvine study reveals that circadian clock disruptions alter the gut microbiome and weaken intestinal barriers, potentially accelerating colorectal cancer progression.

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**Summary:** Research from the University of California, Irvine has uncovered how disruption of the circadian clock, the body's internal 24-hour biological rhythm, may accelerate the progression of colorectal cancer by affecting the gut microbiome and compromising intestinal barrier function. The study found that circadian misalignment, caused by factors like extended light exposure and late-night meals, alters the diversity and function of gut bacteria, leading to reduced intestinal mucus and increased permeability, which allows harmful bacteria to enter the bloodstream and potentially speed up cancer growth.

**Key Takeaways:**

- 1. Circadian Clock Disruption Alters Gut Microbiome:** The study found that disruptions to the body's internal clock change the diversity and composition of gut bacteria, potentially exacerbating cancer progression.
  - 2. Compromised Intestinal Barrier:** Circadian misalignment leads to reduced intestinal mucus, weakening the gut's defense and increasing permeability, allowing toxins and harmful bacteria to enter the bloodstream.
  - 3. Link Between Lifestyle and Cancer Risk:** Environmental factors, such as light exposure and late-night meals, may disrupt the circadian clock, suggesting a connection between lifestyle choices and increased colorectal cancer risk.
- 



# Pineal Body

- Produces Melatonin
- Fluoride/calcification issue/disturbed
- sleep/ early aging/alzheimers disease
- Luke J. Fluoride deposition in the aged human pineal gland.
- Caries Res 2001;35:125-128

# Does Sleep Time and Duration Affect Dementia Risk?

Sep 26, 2022 | Brain | 0 | ★★★★★



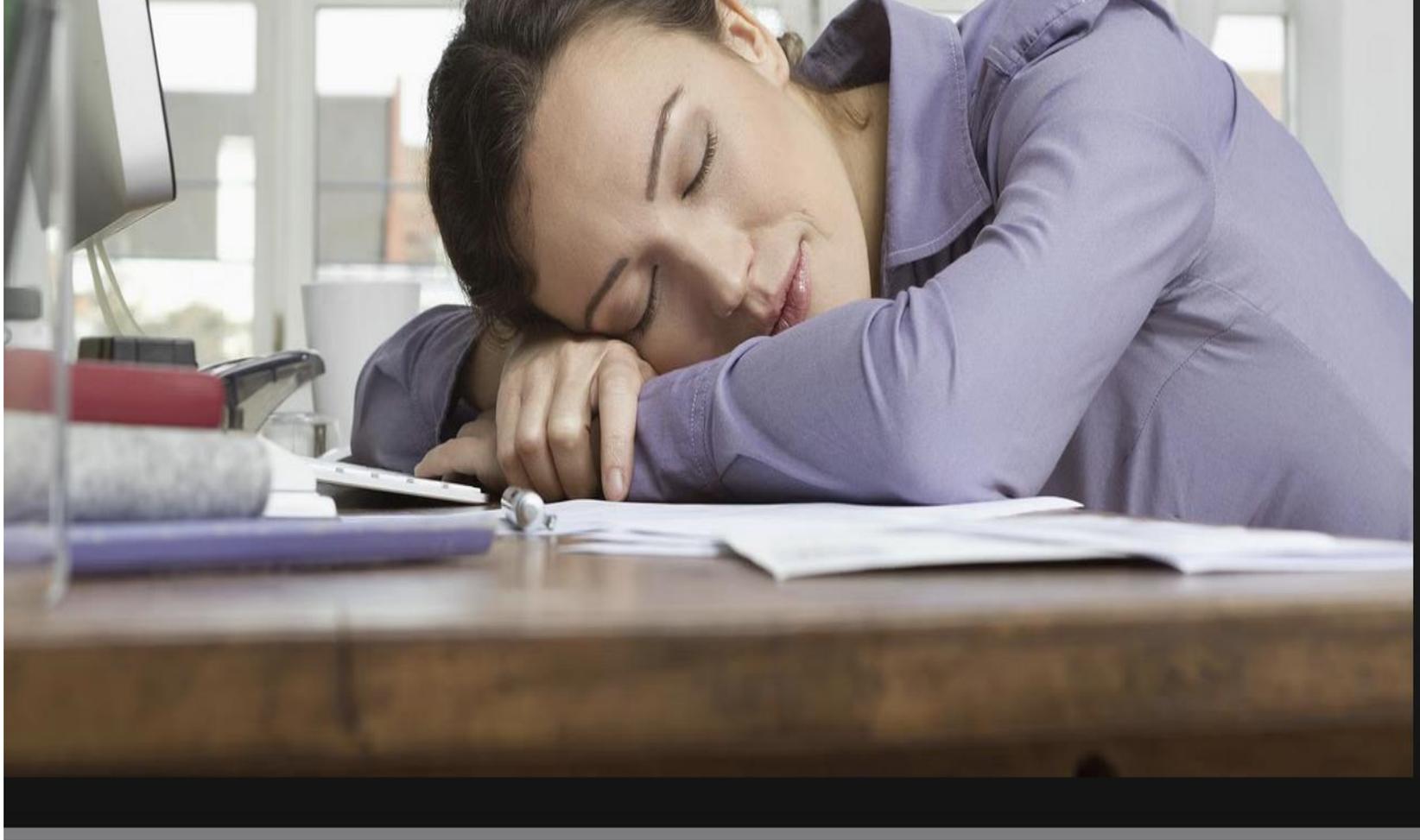
# Alzheimer's Disease



## Alzheimer's Disease

- Longer naps during the day could be a sign of early dementia
- Study at U. California SF; 1401 older adults were followed with a watchlike device that tracked their mobility for 14 years
- Older adults that napped at least once for over an hour had a 40% higher chance of developing Alzheimers disease than those that did not nap or napped for less than 1 hour per day





Daytime naps decrease stress and lower blood pressure  
Siestas are associated with a 37% decrease in coronary mortality

Naska, et.al. Archives in Internal Medicine, 167.3 (2007); 296-301

The drop in blood oxygen levels that occurs during a sleep apnea episode appears to be linked to degeneration of brain regions associated with memory, researchers reported May 7 in the journal [\*Neurology\*](#).

These brain changes were strongly associated with sleep apnea that occurred during rapid eye movement (REM) sleep, the stage of sleep that involves dreaming and consolidation of the day's new memories, researchers said.

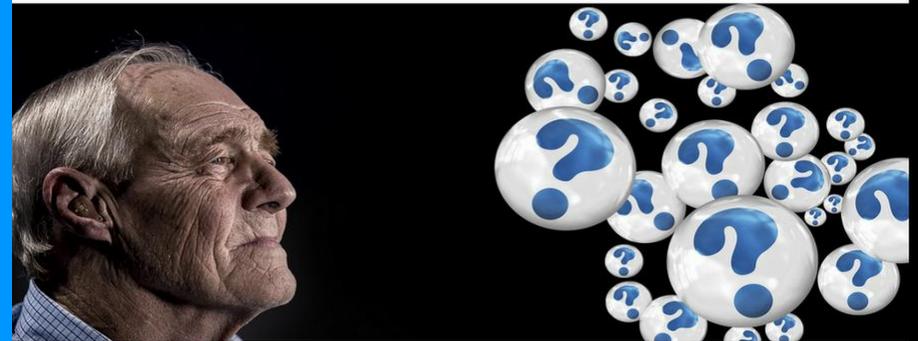
The lower a person's oxygen levels drop due to sleep apnea during REM sleep, the more severe the degeneration to the brain, results show.

“Obstructive sleep apnea is a sleep disorder that increases with age, and low oxygen levels during sleep can harm the ability of our brain and body to function properly,” senior researcher [Bryce Mander](#), an associate professor of psychiatry and human behavior at the University of California-Irvine, said in a news release.

# Will Oral appliances One Day Be an Early Intervention for Alzheimer's Disease

- A pilot study examines whether alleviating snoring in people with mild cognitive impairment and in people with Alzheimer's influences their test scores on cognitive assessment.
- Preliminary findings, Journal of Geriatrics, suggests that reduced snoring with an appliance, is tied with improved cognition

**The link between  
poor sleep**



**and Alzheimer's.  
Are you at risk?**



# Evidence summary: the relationship between oral health and dementia

B Daly <sup>1 2</sup>, A Thompsell <sup>3</sup>, J Sharpling <sup>4</sup>, Y M Rooney <sup>5</sup>, L Hillman <sup>6</sup>, K L Wanyonyi <sup>7</sup>, S White <sup>8</sup>, J E Gallagher <sup>9</sup>

Affiliations + expand

PMID: 29192686 DOI: [10.1038/sj.bdj.2017.992](https://doi.org/10.1038/sj.bdj.2017.992)

## Abstract

This is the fourth and final paper of a series of reviews undertaken to explore the relationships between oral health and general medical conditions, in order to support teams within Public Health England, health practitioners and policy makers. This review aimed to explore the most contemporary evidence on whether poor oral health and dementia occurs in the same individuals or populations, to outline the nature of the relationship between these two health outcomes and to discuss the implication of any findings for health services and future research. The review was undertaken by a working group comprising consultant clinicians from medicine and dentistry, trainees, public health and academic staff. Whilst other rapid reviews in the current series limited their search to systematic reviews, this review focused on primary research involving cohort and case-control studies because of the lack of high level evidence in this new and important field. The results suggest that poor oral hygiene is associated with dementia, and more so amongst people in advanced stages of the disease. Suboptimal oral health (gingivitis, dental caries, tooth loss, edentulousness) appears to be associated with increased risk of developing cognitive impairment and dementia. The findings are discussed in relation to patient care and future research.

# The Relationship Between Dementia, Parkinson's, and Sleep

Feb 20, 2025 | Brain | 0 🗨️ | ★★★★★



*By Mikal Williams, RPSGT, RST, BSBA*

**Summary:** Sleep disturbances in dementia and Parkinson's disease are both a symptom and a contributing factor to disease progression, as neurodegenerative changes disrupt circadian rhythms, melatonin production, and motor control, while poor sleep accelerates cognitive decline, neuroinflammation, and oxidative stress. Addressing sleep through consistent routines, environmental adjustments, physical activity, medication management, and behavioral therapies can improve patient well-being and potentially slow disease progression.

**Key Takeaways:**

- Brain degeneration (especially of the suprachiasmatic nucleus) disrupts circadian rhythms.
- Reduced melatonin production and behavioral symptoms (e.g., sundowning) contribute to sleep disturbances.
- Prioritizing sleep quality in dementia and Parkinson's care can enhance patient well-being and potentially slow disease progression.
- Caregivers and healthcare providers play a key role in implementing sleep-supportive strategies.



## How are depression and sleep-related?

- Depression can cause a decrease in Serotonin which helps with moods, thinking.
- Serotonin is a precursor to Melatonin, the neurotransmitter that promotes sleep

# DIAGNOSTIC TESTS



THE SAGE TEST

MINI-COG TEST

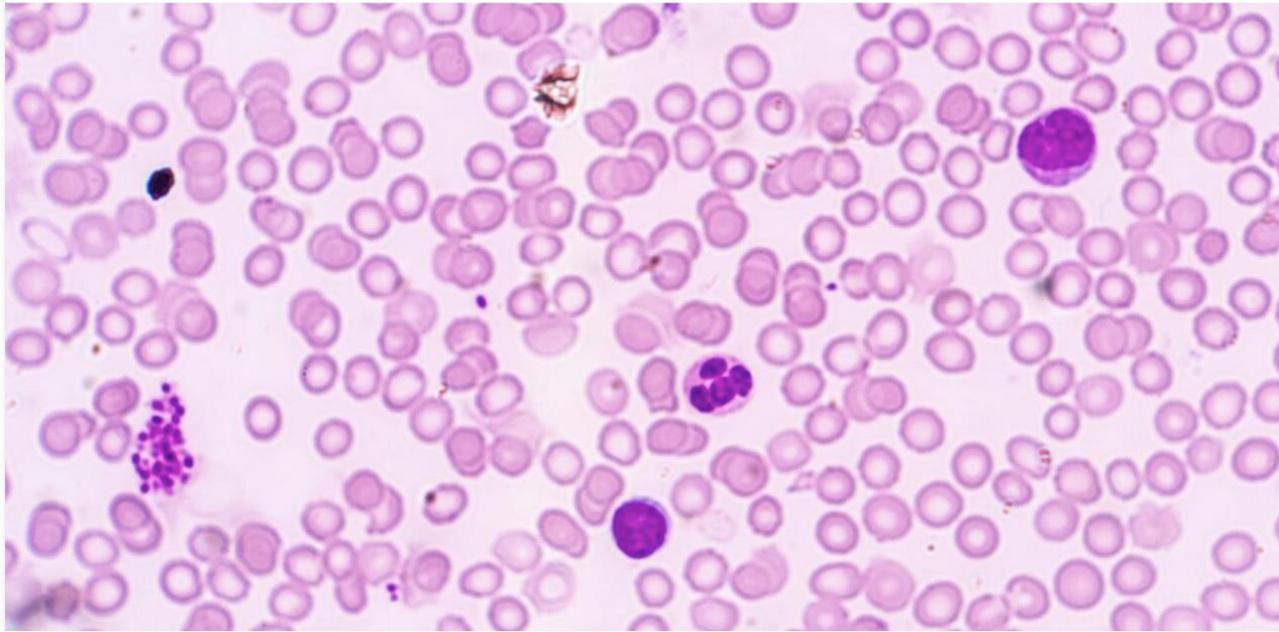
MINI-MENTAL TEST

MONTREAL COGNITIVE  
ASSESSMENT

Sleep supports normal production of stem cells which are the building blocks of the immune system. Good sleep reduces the body's inflammatory burden

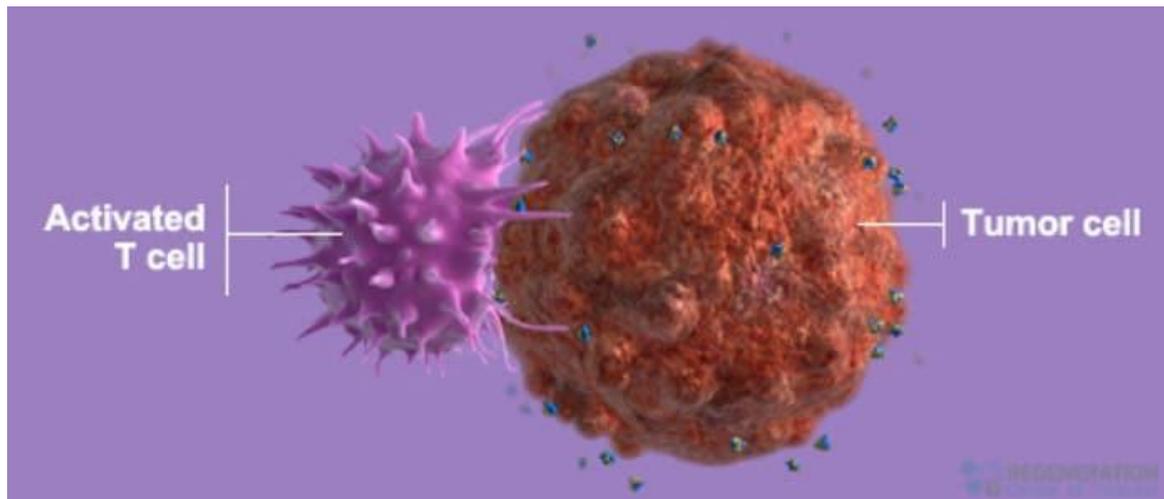
### This is How Cutting Back on Sleep Changes the Immune System

Sep 26, 2022 | Immunity | 0 ● | ★★★★★



# Immune System

- Sleep fights infection and sickness by strengthening the immune system
- When your ill, you want to sleep
- 2002 study, sleep greatly affects your response to the flu vaccine
- Cancer; killer cells target malignant tumors
- In Denmark--Shift workers have increased odds of breast, prostate and colon cancer



# OBESITY AND OSA CAUSE OR EFFECT

Multiple arousals with OSA interrupt the endocrine system in such a way that many hormones associated with obesity, appetite and metabolism are affected.

Could there be a bilateral association of obesity and obstructive sleep apnea?

Your role as a Hygienist Dentist?

CDA article

# Weight Gain and Obesity

- Loss of sleep effects two hormones;
- Leptin, sends the message that you've had enough to eat, no longer hungry
- Ghrelin, sends the message, eat as if it were your last meal
- Less than 7-8 hours of restful sleep unleashes Ghrelin into your system





# Ghrelin

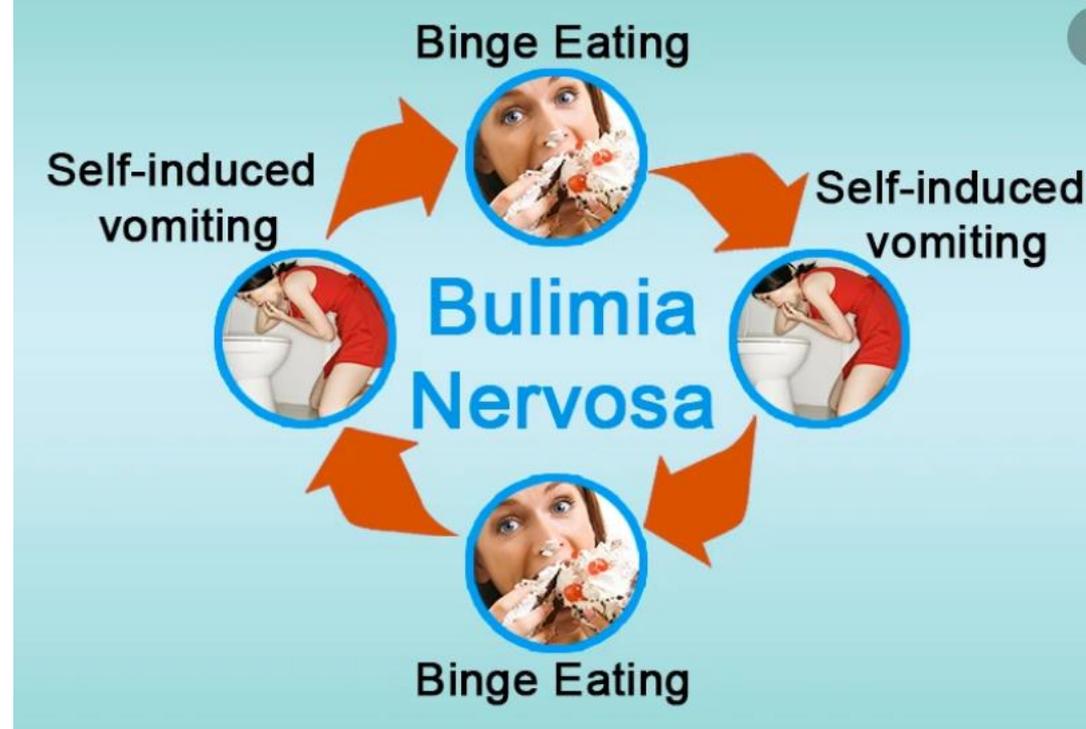
- Peptide produced in the stomach and hypothalamus
- Effect is opposite to leptin
- Ghrelin is the only known appetite stimulating hormones in humans
- Levels increase before meals
- Sleep deprivation increases ghrelin, increases appetite, especially carbohydrates



# LEPTIN

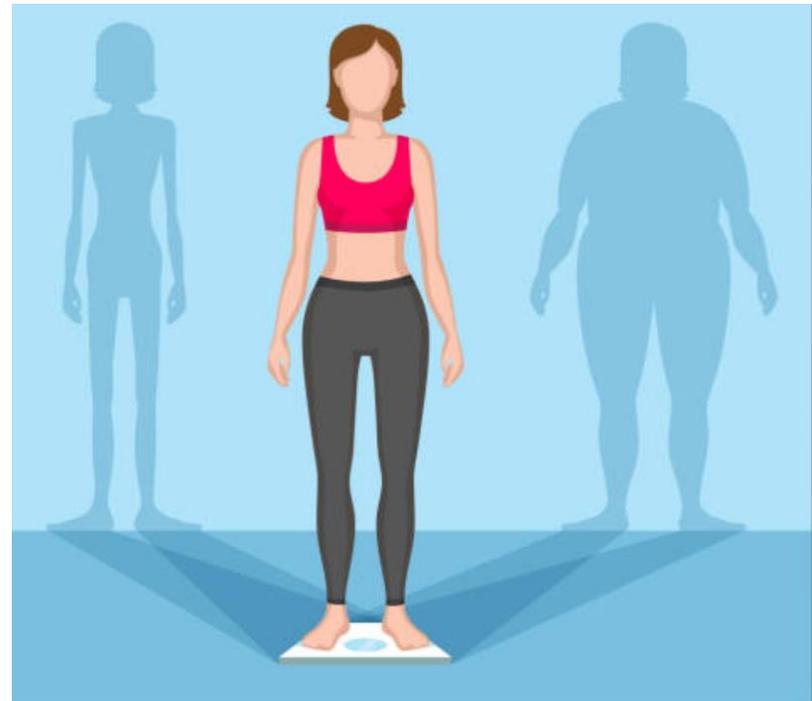
- Produced by Adipocytes, provides information regarding energy states to regulatory centers of the brain.
- Leptin suppresses appetite and promotes weight loss
- Levels increase with sleep
- Multiple arousals of OSA decrease leptin levels

# Bulimia Nervosa



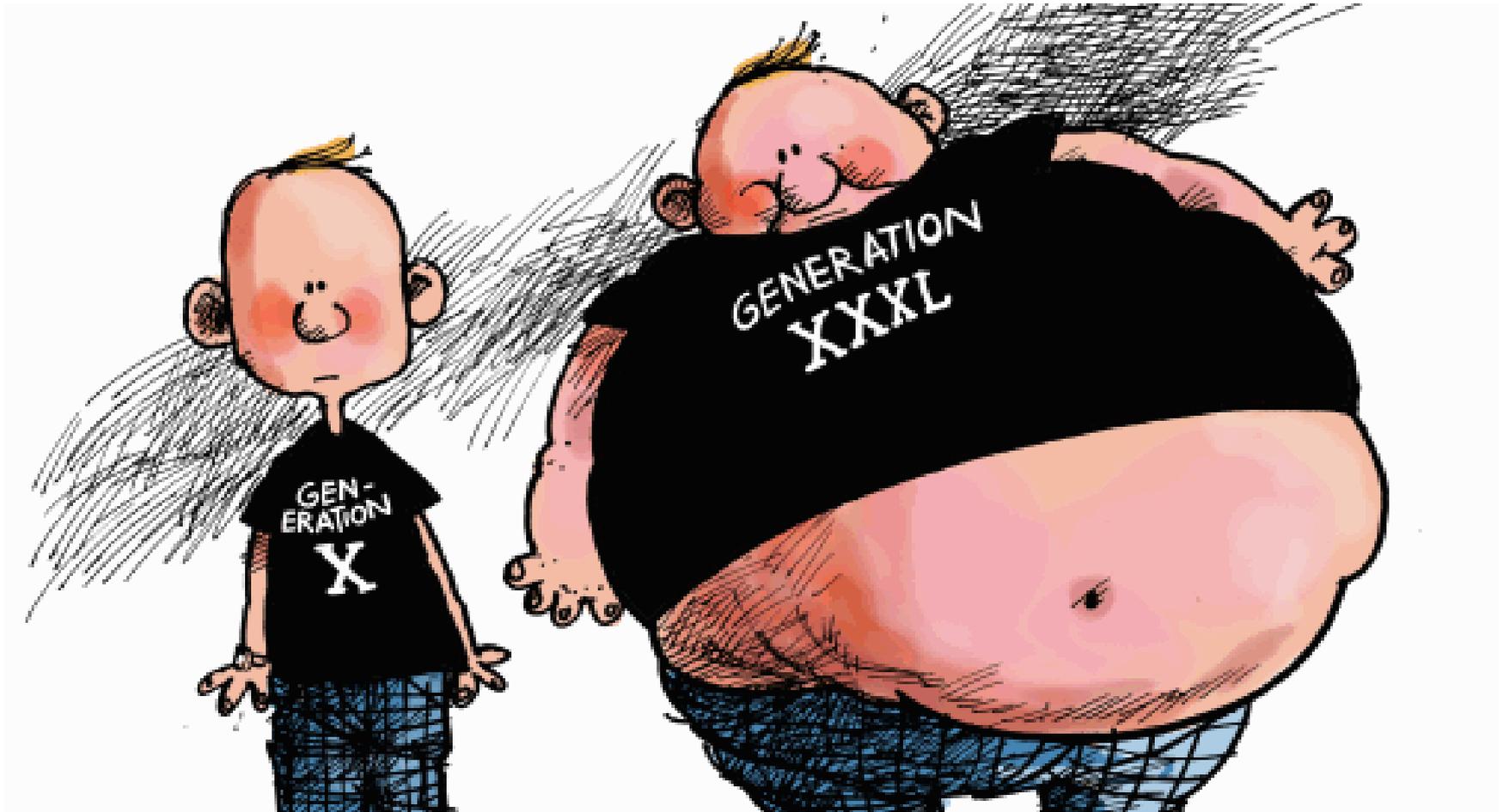
- Mental illness
- Binge and purge
- Positive results with Cognitive Behavior training
- Young females
- Self esteem is linked to body appearance
- Prozac, SSRI's (selective serotonin uptake inhibitors)  
Depression

# Anorexia Nervosa



- Restrictive eating habits
- Excessive exercise
- Diet pills
- Young females
- They develop a sense of control over their bodies
- High psychiatric mortality rate
- Twiggy

# What's happening to Generation X?





# Studies by Dr. Eve Van Cauter

- Healthy adults were given the opportunity to sleep 8-9 hours for 5 days and had their food consumption monitored.
- The study was changed to them sleeping 4-5 hours and had their food consumption monitored
- In the second stage they averaged an increased calorie intake of 300/cal/day

## Restaurant Veggie Burger



2/5 of Ruby Tuesday's Veggie Burger

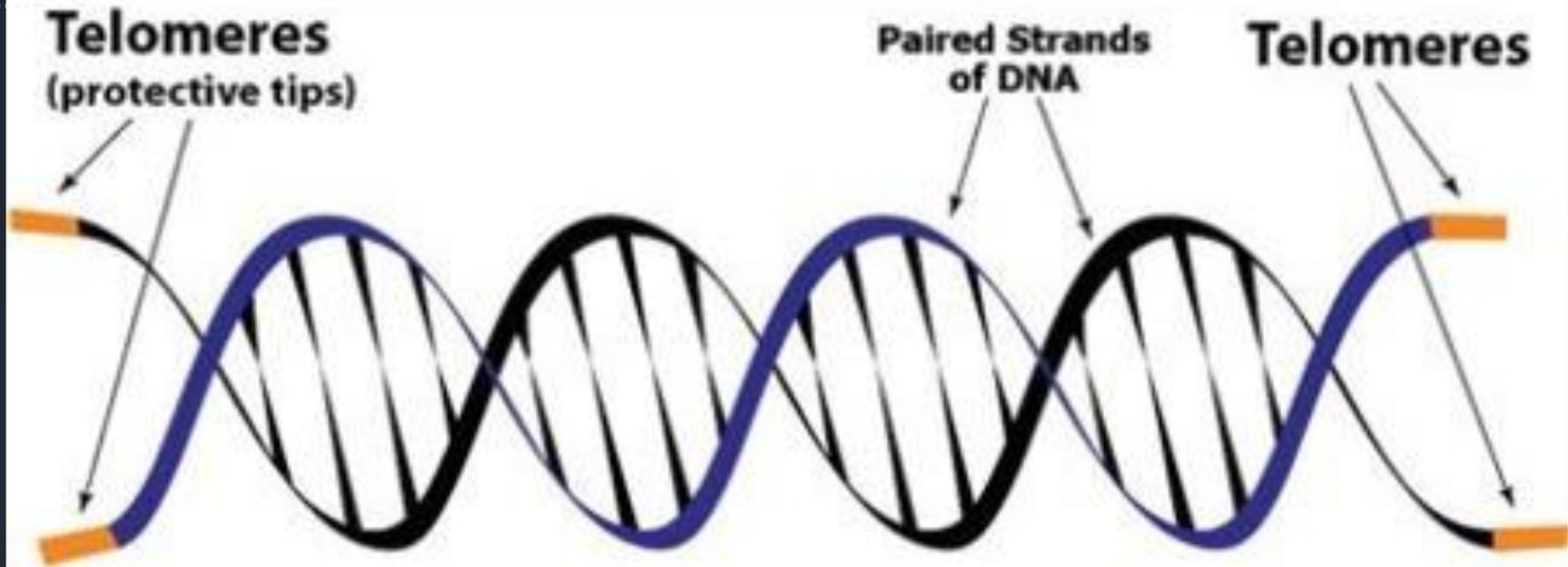
Entire Portion  
955 calories  
52 g fat  
76 g carbs

I think I found that 10-15 lbs you're trying to lose

- With the average sleep time of 4-5 hours , electrode monitors noticed an increased Ghrelin output.
- 300 calories /day equals and additional 70,000 calories per year which relates to 10-15 lbs



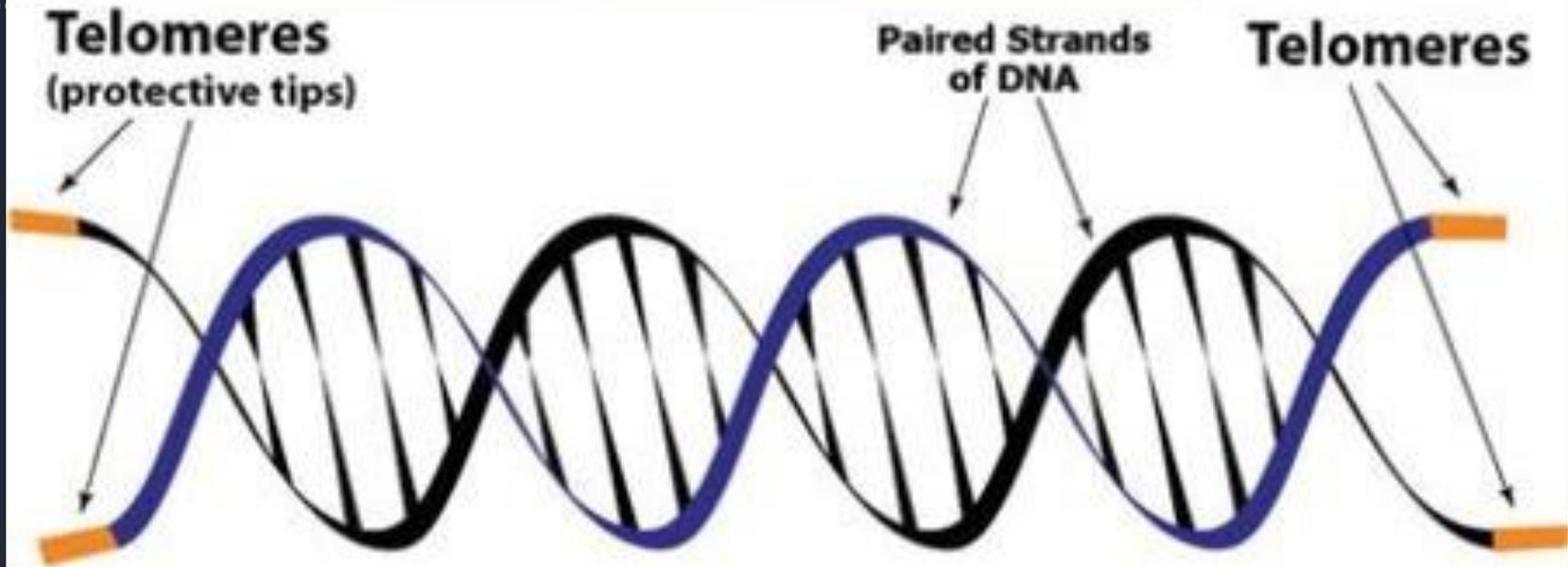
CHROMOSOMES ARE PAIRED STRANDS OF DNA  
FORMED AS THE DOUBLE HELIX



# Genes---DNA

- Spiral strands of DNA
  - Float in the cell nucleus
  - Wound into chromosomes which are capped at each end with a Telomere
  - If damaged
    - The spiral is weakened. aglet
    - Genetic code affected
    - Reports relate to decreased sleep as a factor

CHROMOSOMES ARE PAIRED STRANDS OF DNA  
FORMED AS THE DOUBLE HELIX

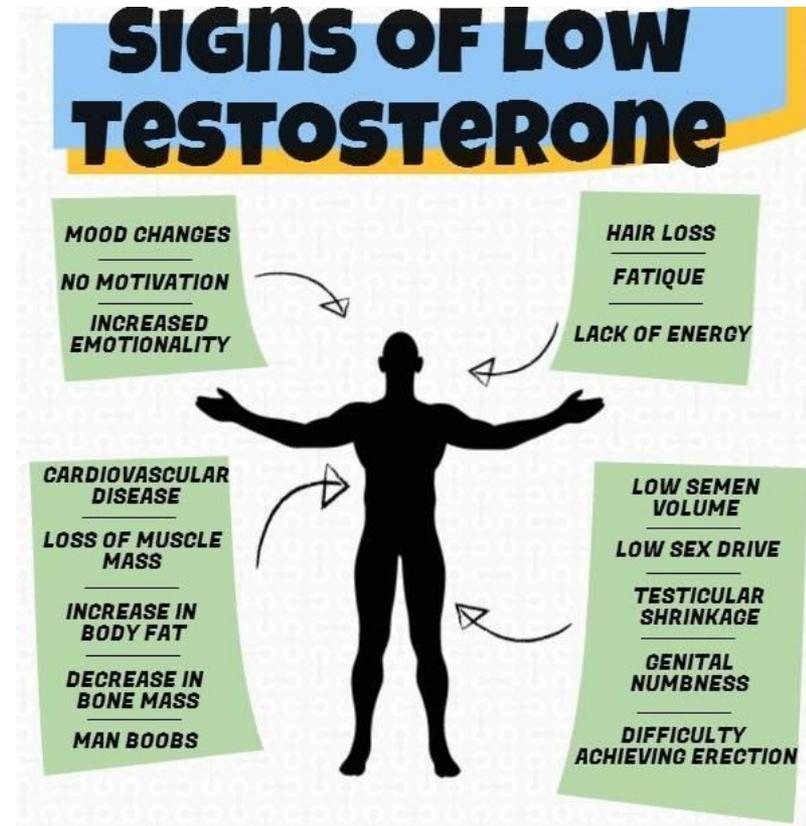


## Genes---DNA

- Study by Dr. Derk-Jan Dijk, Surry sleep Research Center
  - Restricted men and women to 6 hrs/day sleep for one week
  - Blood studies detected 711 distorted genes in these previously not involved subjects

# Reproductive System

- In men, decreased sleep results in decreased testosterone levels and ages a man 10-15 /yrs
- 29% lower sperm count with increased deformities
- Decreased testicular size, daily fatigue and loss of brain focus.
- Testosterone is also responsible for bone density, muscle and strength



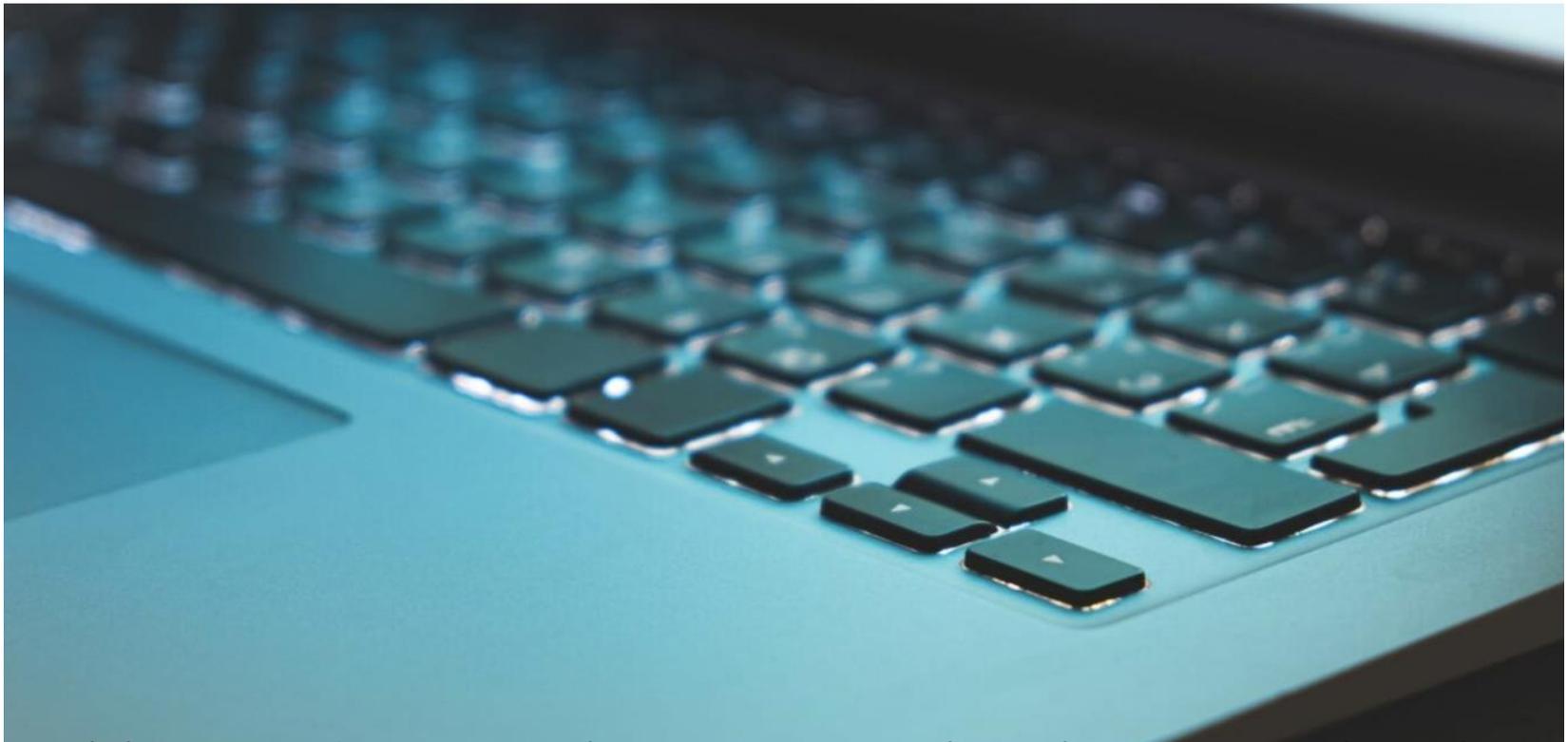


## Reproductive System

- In women, decreased sleep results in a 20% drop in follicular releasing hormone required for conception
- Combining men and women as a couple, sleeping less than 6 hrs/night may experience infertility or sub-fertility.

# Blue Light Exposure Changes Puberty Onset and Ovarian Tissue, Study in Rodents Suggests

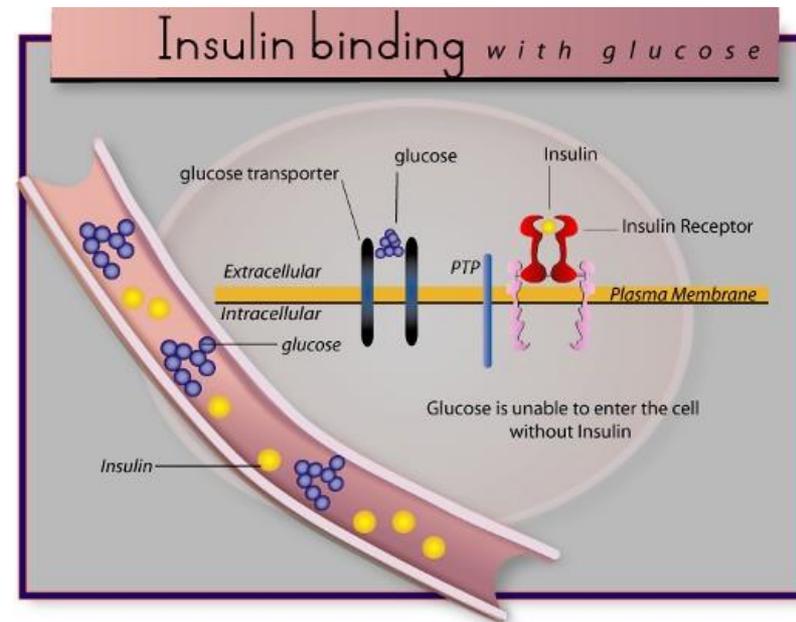
Sep 26, 2022 | Sleep & the Body | 0 🗨️ | ★★★★★



Tablets and smart phones may alter hormone levels and increase the risk of earlier puberty, decrease melatonin levels and physically change ovaries,

# Diabetes

- Decreased sleep results in increased eating (ghrelin).
- Body can not handle increased sugar in the blood with an increased probability of developing type-2-diabetes
- When healthy, insulin
  - Will manage the increased glucose in bloodstream
  - But with decreased sleep, cell sensitivity to insulin decreases,
  - Over time will lead to
    - Pre-diabetic
    - Type-2-diabetes





# Between Diet, Diabetes, and Dementia

DIABETES



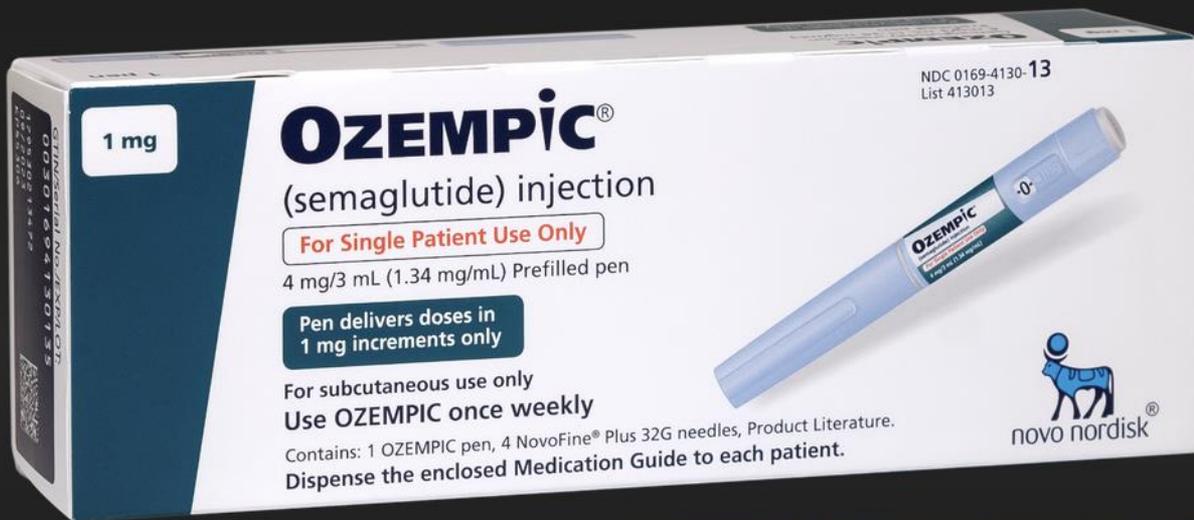
- Diabetics are more prone to dementia. Increased blood sugar yields insulin resistance leading to amyloid plaques
- 
- O'Hara T et al. ,The Hisayama Study, Neurology 77.12 (2011) 1126-1134



When examining individual risk factors, the analysis revealed that for cardiovascular disease, the absence of diabetes was associated with an estimated lifetime difference of 4.7 years among women and 4.2 years among men; the absence of smoking was associated with a difference of 5.5 years among women and 4.8 years among men.



For overall mortality, the absence of diabetes was associated with a lifetime difference of 6.4 years among women and 5.8 years among men, and the absence of smoking was associated with a difference of 5.6 years among women and 5.1 years among men.





Ozempic is medicine for adults with type 2 diabetes that along with diet and exercise may improve blood sugar. **STEVE CHRISTO - CORBIS/CORBIS VIA GETTY IMAGES**

## What To Know

A 2023 study from JAMA found that drugs like Ozempic are associated with an increased risk of serious medical conditions, including stomach paralysis, pancreatitis, biliary disease and bowel obstruction.

---



**CONFLICT**

**OF**

**INTEREST**

# The MindBody GLP-1 System

- Increases GLP-1 by 140% on average<sup>Ω</sup>
- Balances hunger hormones\*
- Strengthens gut-brain axis\*
- Helps maintain balanced blood sugar\*\*
- Optimizes gut microbiome\*



Weight Loss +  
Less Cravings\*

95%  
reduced  
sugar cravings<sup>†</sup>

9 lbs  
average lost  
in 8 weeks<sup>†</sup>



# Noelle M Santucci, DDS

Redwood City, CA

**M** 650-468-8847 / **O** 650-468-8847

NoelleDDS@comcast.net

[www.DrSantucciWellness.com](http://www.DrSantucciWellness.com)



Break Time



**NEW  
PRODUCT**



**COCOFLOSS**  
*relax & floss*

**COCOFLOSS**  
*relax & floss*

**COCOFLOSS**  
*relax & floss*

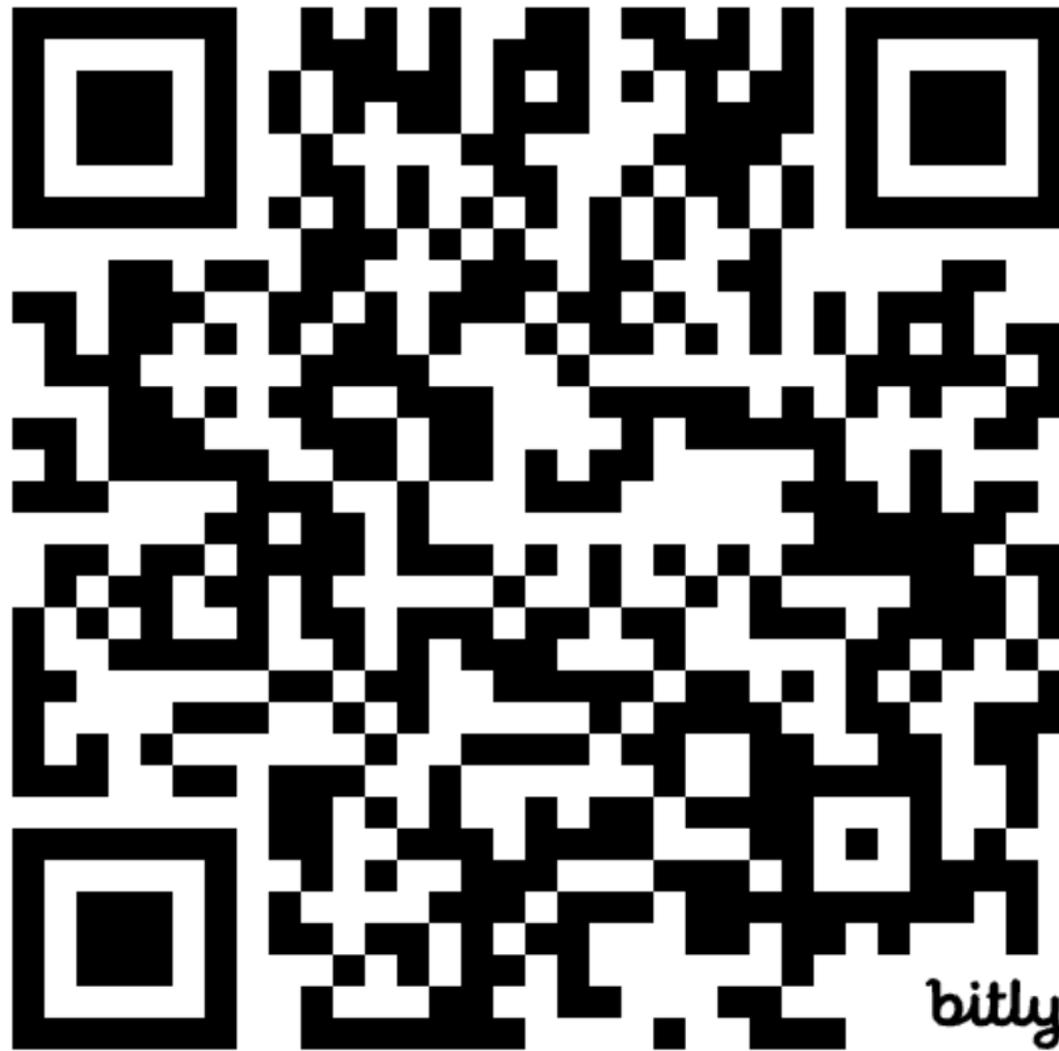
**COCOFLOSS**  
*relax & floss*

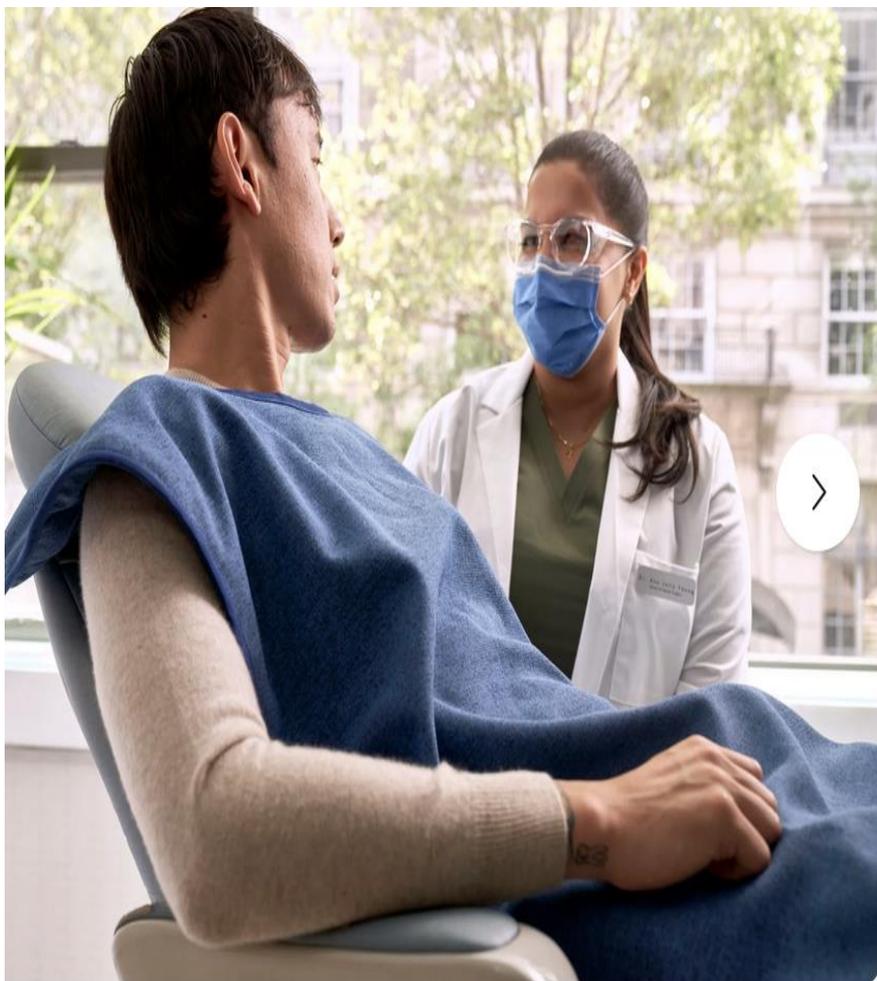


COCOFLOSS  
DELICIOUS  
MINT  
relax & floss

32 yd floss

protect your privacy, some external images in this message were not downloaded.





# Adult Wallaby

\$499.00

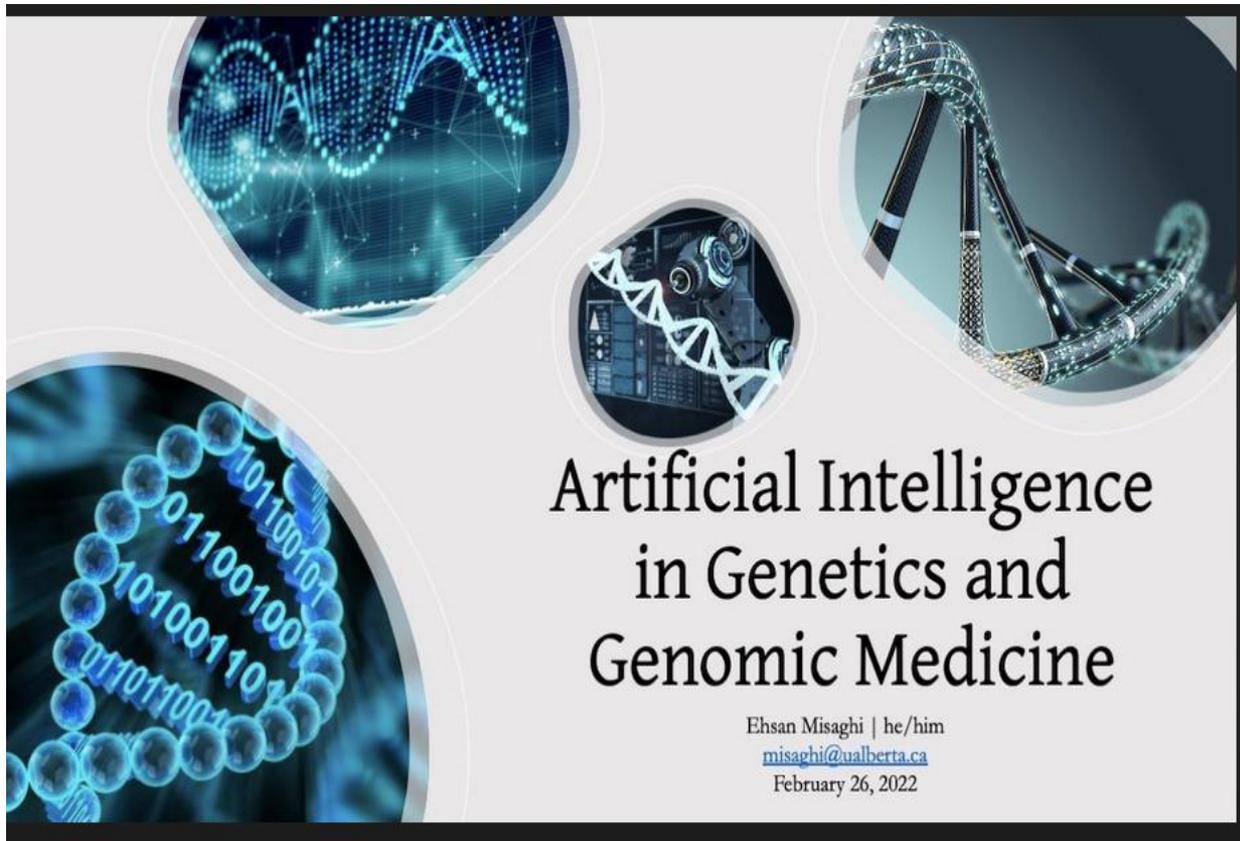
ADD TO CART

Thoughtfully engineered, our 10 lb. Therapeutic Hug Blanket delivers deep-pressure stimulation to induce relaxation, lower cortisol, and create a comforting environment that ensures patients feel protected and cared for throughout their visit.

Details



# AI Genetics Periodontal / Carious Potential



Artificial Intelligence  
in Genetics and  
Genomic Medicine

Ehsan Misaghi | he/him  
[misaghi@ualberta.ca](mailto:misaghi@ualberta.ca)  
February 26, 2022

## Abstract

Genetic screening for finite set of dental conditions that have an association with detectable genetic germline alterations that are clinically studied. Genetic influencers can include, but not limited to, direct and indirect influencers (cancer), lifestyle influencers (BMI, type II diabetes), demographic influencers (age, sex), and regional influencers (country, province). Genetic analytes include genetic risk factors variable population frequency and with well-established and published evidence for increased or decreased risk association for various dental indications included in this assay.

The oral health product captures six criteria, each with defined influencers.

### **Indications for Oral Health Product offering:**

1. Periodontal disease
2. Tooth decay
3. Oral cancer
4. Misaligned teeth (malocclusion)
5. Cleft lip and cleft palate
6. Yellow Teeth (amelogenesis imperfecta)





# Tested. Reviewed. Approved.

by the Catapult Education  
Product Review Board

Read the Review



## SLATE

Electric Flosser



SLATE  
ELECTRIC FLOSSER

catapult™  
vote of confidence

TRUSTED BY DENTAL EXPERTS



## Hello Gum Sweeps.

Gentle bristles that massage gums & remove grim from the hard to reach places other flossers can't get.



## Reduce Waste.

Multi-use floss heads can keep almost 700 floss picks from hitting the landfill per year.



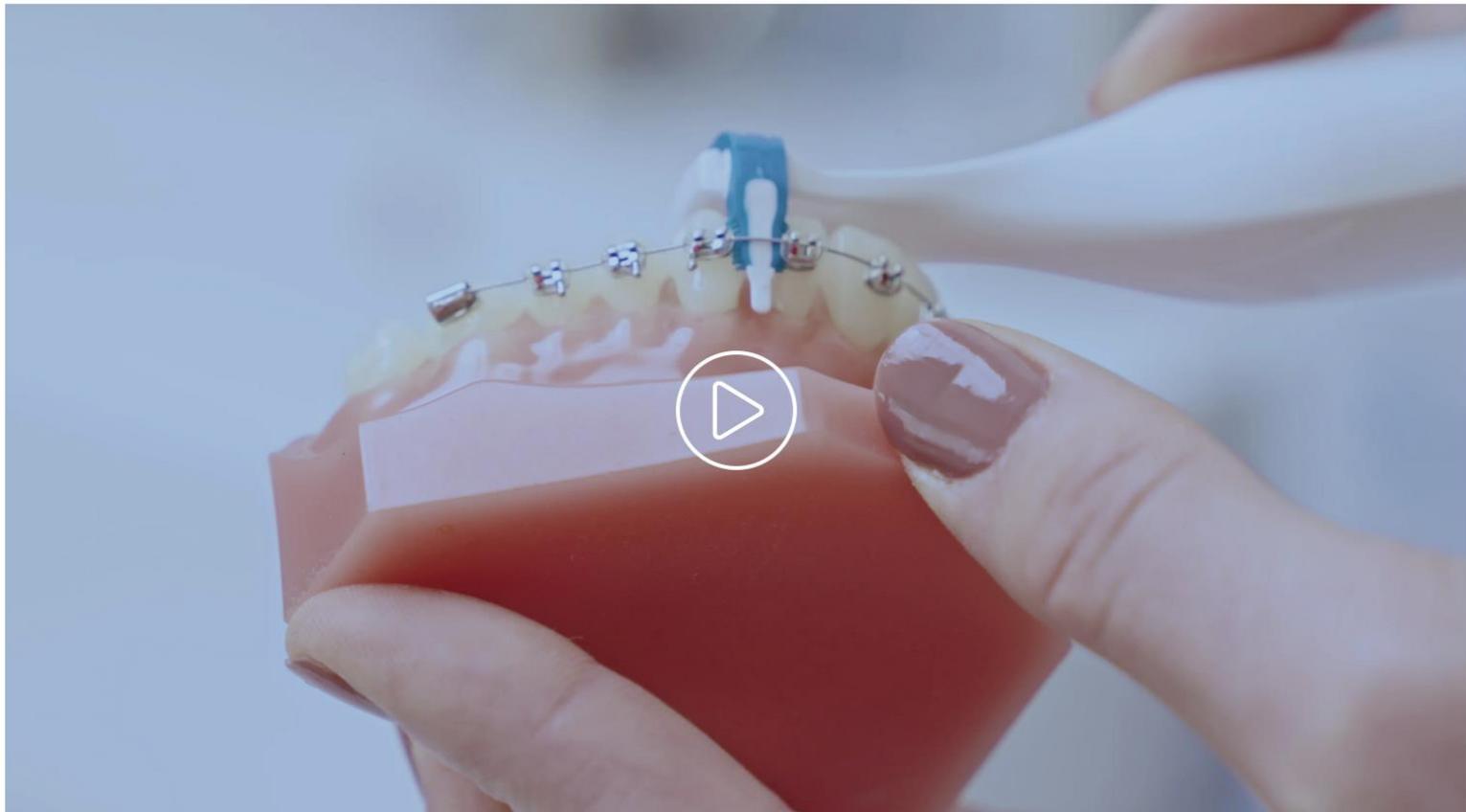
## 12,000+ Vibrations Per Minute.

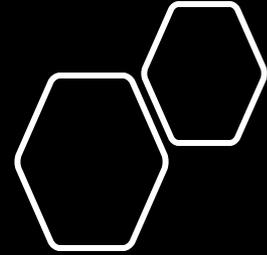
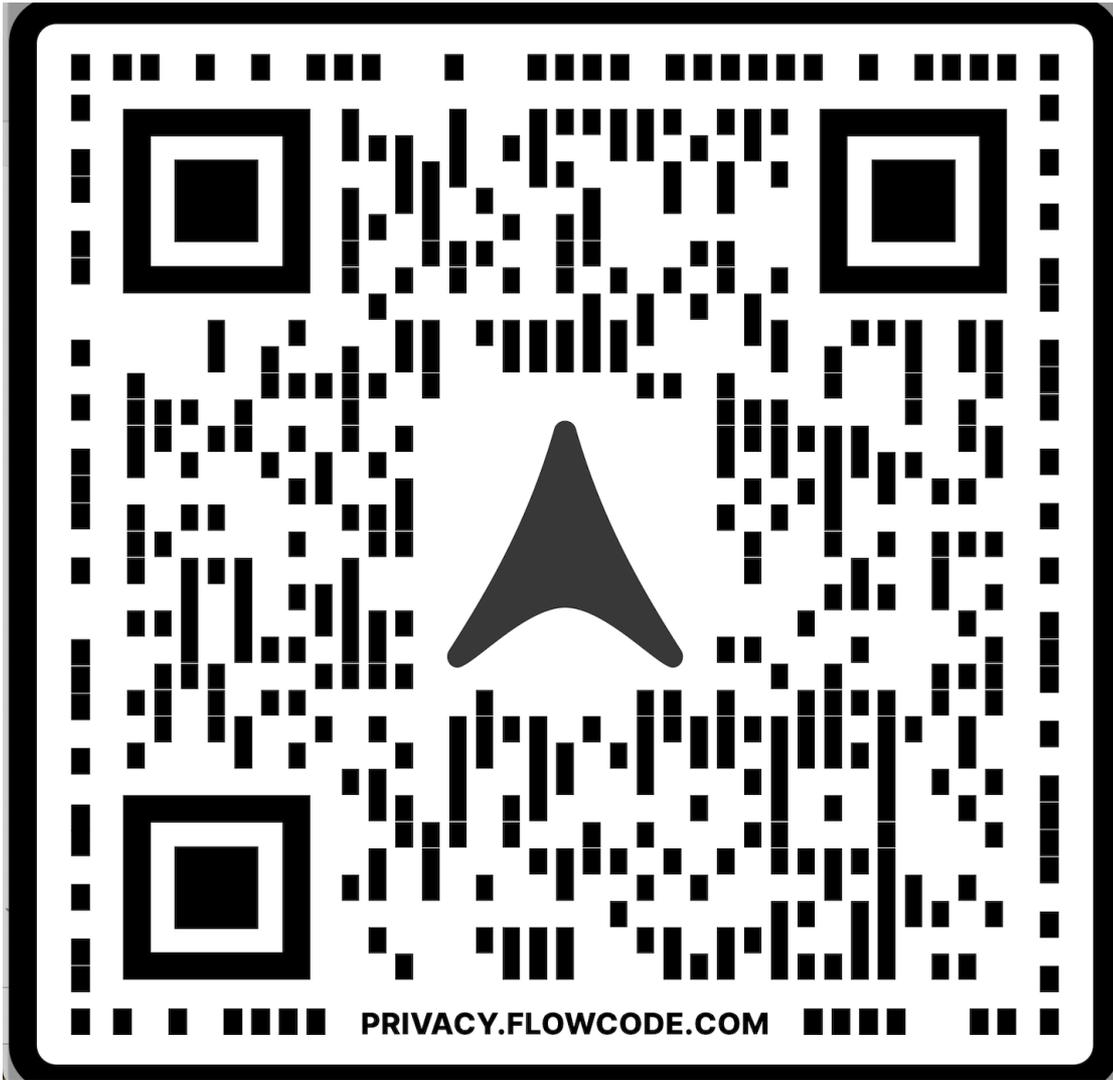
Sonic vibrations help floss pass through tooth contacts with ease - hitting bacteria right where it counts.



## Tongue Scraper.

Anatomically-shaped, 3 blade design removes up to 30% more odor causing bacteria than a toothbrush.





# Sports



- Which sport prohibits left handed players ?
- Cricket
- Polo
- Golf
- Badminton
- If you guessed correctly, take a break

# What is the Connection to our General Dentistry Practice ?



Initial  
Presentation  
Goals

Understand the meaning of sleep

Natural healthy sleep

Interrupted sleep,  
disturbances

Discuss the co-morbidities of  
unhealthy sleep

What is practical for your office

# Let's Get Practical

- How does including sleep evaluation or treatment fit into your present practice mode
  - Keep up with the standard of care expressed by the ADA and not disrupt our office routine
    - Sleep Survey
    - Refer
- If office wishes to include sleep evaluation and treatment, where do you start?
  - Sleep Mini Residency Program



Should Your  
Practice Be  
Concerned?

Why?



## Front Office Concerns if we Incorporate Sleep

- Have we completed a sleep survey
- Do we have a completed sleep study with a physicians diagnosis
- Have we completed an in depth orofacial exam
- Do we need a preauthorization
- How do we bill/ what do we bill
- Should we get help when starting

# Presentation Goals as we move forward



- Consider new paradigms as you diagnose and treat your patients
- Evaluate the interactions of
  - Gerd
  - Bruxing
  - Saliva
  - Erosion as they relate to OSA and dental wear
  - Periodontal disease, really?
- Discuss the
  - Diagnosis
  - Prevention and
  - Treatment of erosive dental wear



## OVERVIEW

- Dentist should incorporate thorough examination of the mouth
  - IOE
  - EOE
  - Caries
  - Periodontal disease
- By visualizing the upper airway
  - Evaluate patients potential for SDB (sleep disordered breathing)

# OVERVIEW

## 01

Evaluate the following:

- Airway crowding
  - Narrow palate
  - Enlarged tonsils
  - Restrictive lingual frenum
- Mallampati Index
- Scalloped tongue

## 02

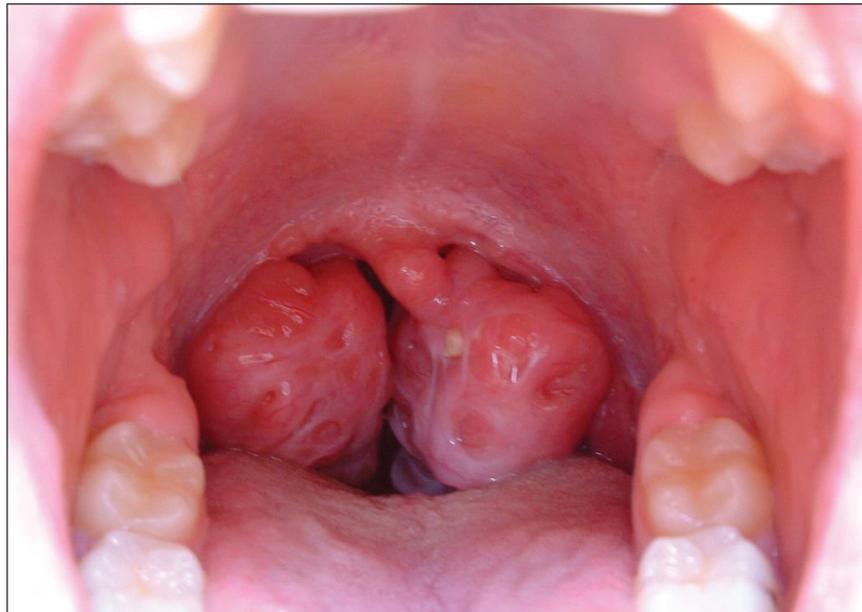
Discuss these upper airway findings with patient

## 03

Refer patient for a sleep evaluation

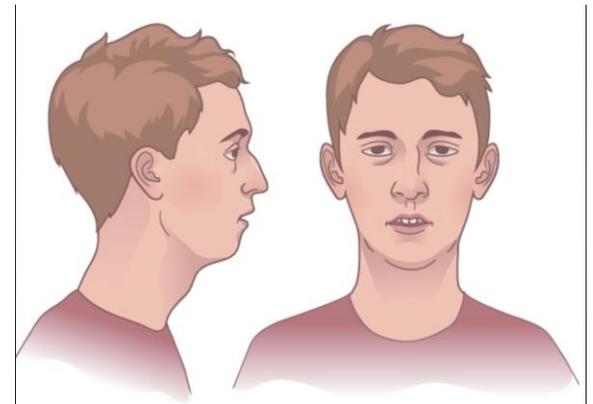
# Primary Clinical Findings

- Primary; Adenotonsillar Hypertrophy
- T/A surgery - 500 thousand yearly
- 50-80% improvement with disturbed sleep score
- 1-2% irreducible rate of post-op hemorrhage



# Secondary Clinical Findings

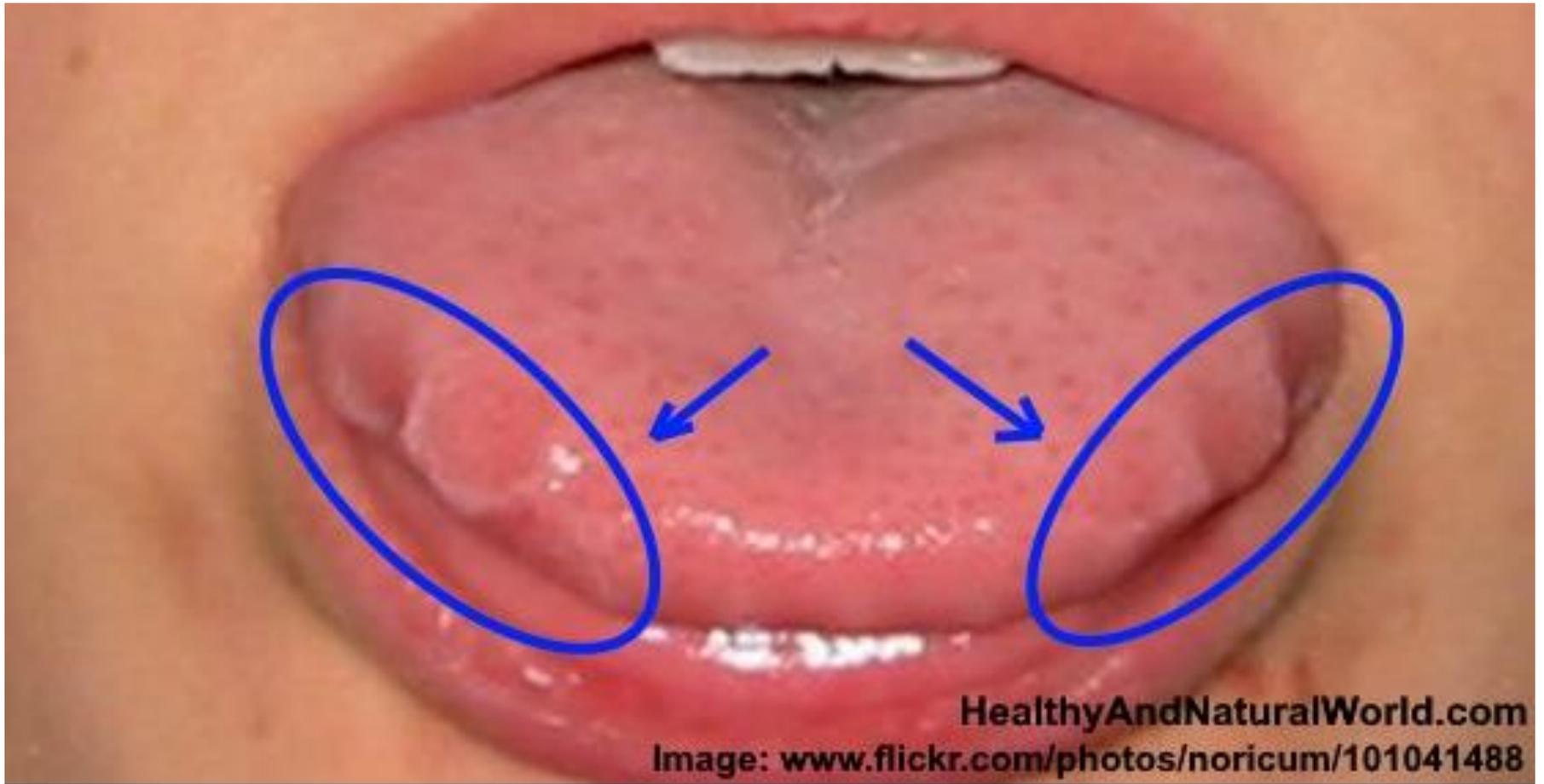
- Mouth breather
- Nasal airway obstruction
- Allergic shiners
- Allergies
- GERD
- Tooth wear
- High vaulted palate
- Adenoidal face shape



# Mallampati Index



# Scalloped Tongue



HealthyAndNaturalWorld.com

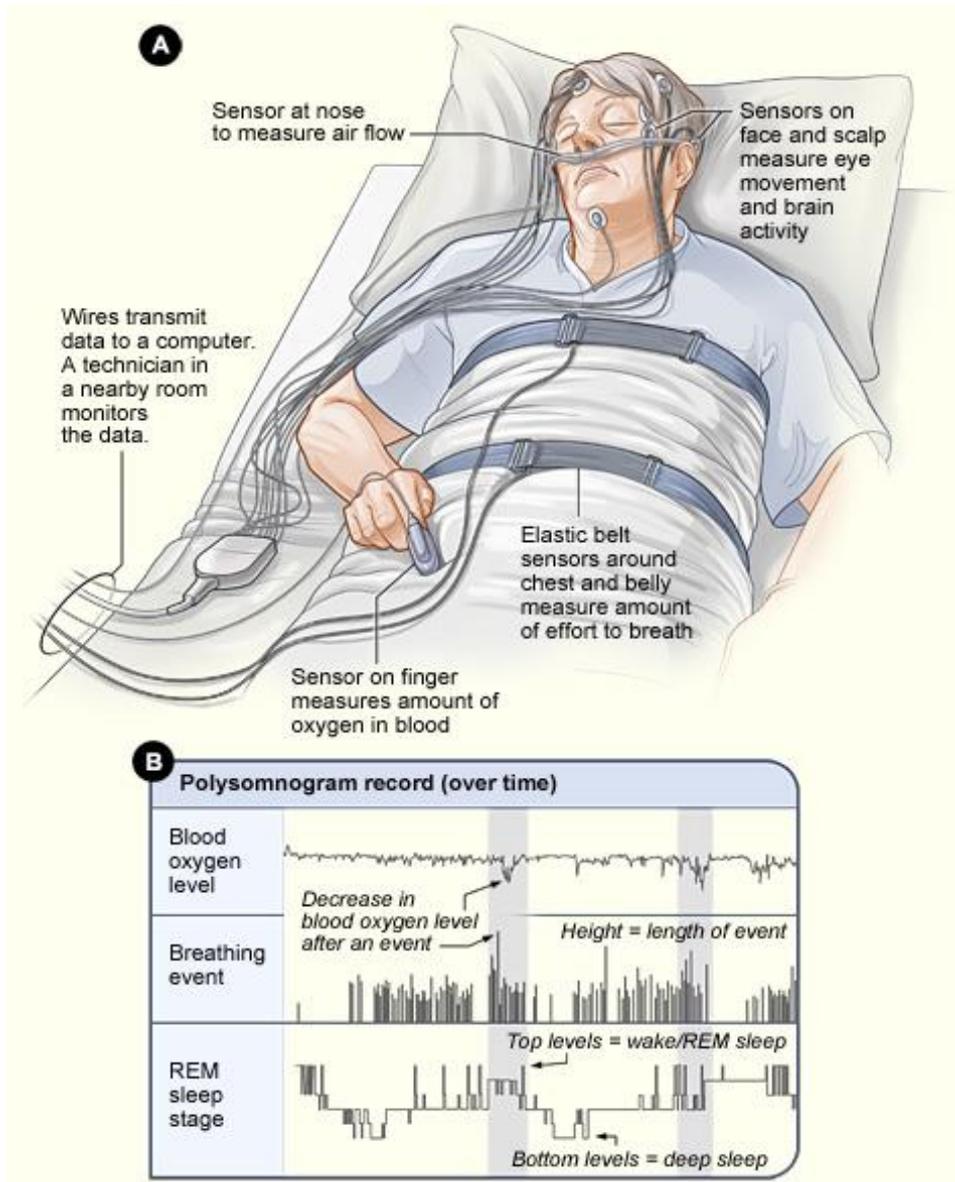
Image: [www.flickr.com/photos/noricum/101041488](http://www.flickr.com/photos/noricum/101041488)

# Scalloped Tongue Etiology

- Downs Syndrome
- Hypothyroid Disease
- Apert Syndrome
- Amyloidosis
- Sleep Apnea
- Parafunctional Activity



# Hospital Version



# Take Home Version



## C-PAP Machine



# Lullaby™

## PEDIATRIC SENSORS

The most advanced and innovative family of diagnostic sleep sensors made especially for pediatric patients.

by **DyMedix**  
DIAGNOSTICS







Mandibular Advancement  
Appliances

Fjkljsklfjaskljf;lkasjdf;lkajs;  
lk

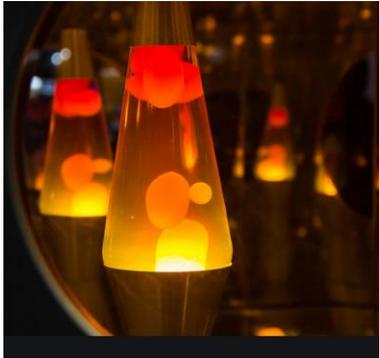
# Bruxism Triad / Comorbidities



Rouse J, Inside Dentistry  
2010;6(5):2010

What's old is NEW again

1960s – lava lamp



1970s – mood rings



Current – Aura rings



## Accuracy Study

Oct 11, 2024 | Wearable Sleep Trackers | 0 | ★★★★★



A study evaluated the accuracy of sleep-staging algorithms in three consumer wearable devices—Oura Ring, Fitbit Sense, and Apple Watch—against gold-standard polysomnography.

## A study evaluated the accuracy of sleep-staging algorithms in three consumer wearable devices—Oura Ring, Fitbit Sense, and Apple Watch—against gold-standard polysomnography.

---

**Summary:** A study funded by ŌURA and conducted by Brigham and Women's Hospital compared the sleep-tracking accuracy of the Oura Ring, Apple Watch, and Fitbit Sense against gold-standard polysomnography. The study found that the Oura Ring outperformed the other two devices in four-stage sleep classification accuracy, wake detection, and deep sleep detection. While all three devices were effective at distinguishing sleep from wake, the Oura Ring demonstrated the highest overall accuracy and sensitivity.

### Key Takeaways:

- 1. Oura Ring Leads in Accuracy:** The Oura Ring was found to be 5% more accurate than the Apple Watch and 10% more accurate than Fitbit in four-stage sleep classification compared to polysomnography.
- 2. Superior Wake and Deep Sleep Detection:** Oura Ring had the highest sensitivity for both wake detection (68.6%) and deep sleep detection (79.5%), outperforming both the Apple Watch and Fitbit in these metrics.
- 3. No Significant Misestimations:** Unlike the Apple Watch, which overestimated light and deep sleep, the Oura Ring did not significantly underestimate or overestimate any of the four sleep stages.



Paradigm Shifts in our General Practice

# Practice Growth

- What is the most reliable, effective means to grow your practice with quality patients?

- Flyers
- Web presence
- Radio/TV spots
- Yellow pages
- Or.....

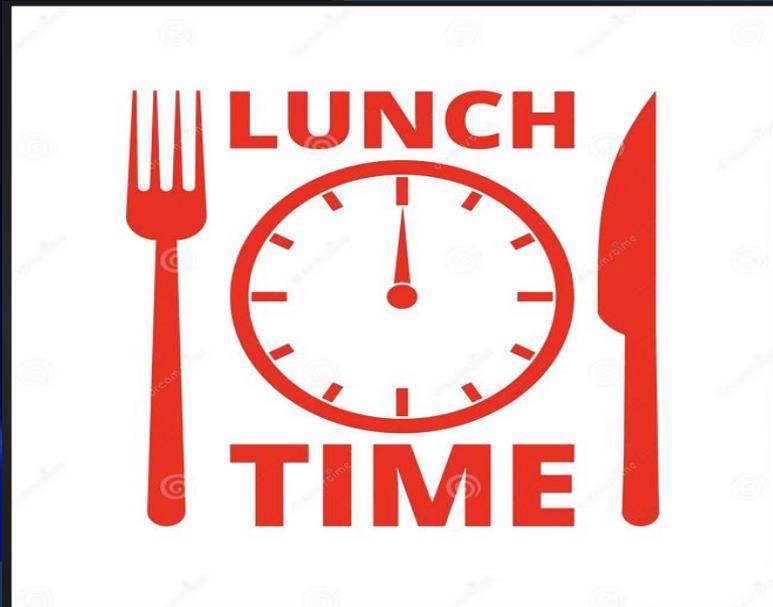


# Word of Mouth Referrals

- Has always been the prime source of new patients.
- Based on service and quality of the experience
- Does adding a sleep presence in your office add quality to the patient experience
- Does improving the quality of your patients total health set you apart
- Does possibly changing a child's life count







# SLEEP BRUXISM: Myths, Misconceptions and Management Strategies



# Bruxism Triad / Comorbidities



Rouse J, Inside Dentistry  
2010;6(5):2010



## SLEEP BRUXISM: Myths, Misconceptions and Management Strategies

- Is tooth wear related to bruxism?
- What is the cause of bruxism?
- Are all “bruxisms” alike- sleep v. awake bruxism?
- Does occlusal splint therapy result in less bruxism?

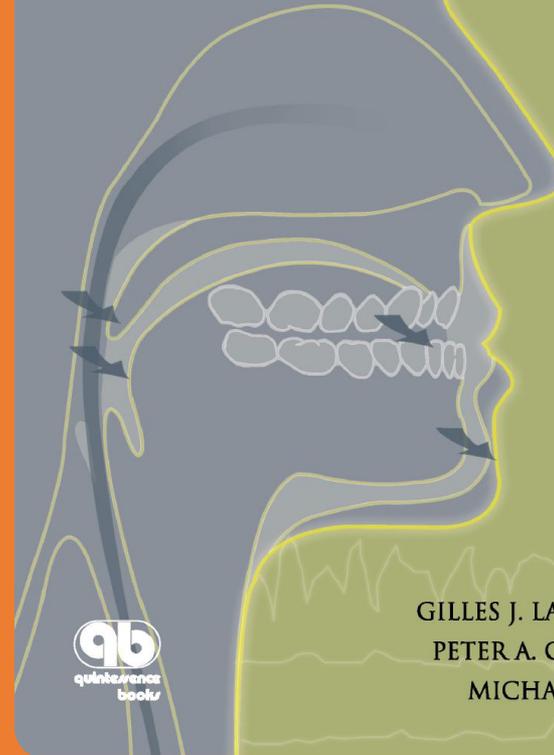
# Course Objectives: To expand your 'world view' of bruxism

- Think of bruxism as a wear problem-not just tooth grinding.
- If it is a wear problem, look at the causes of tooth structure loss (acid erosion/corrosion, attrition (bruxism), abrasion, abfraction).
- Sleep bruxism vs. Awake bruxism: SB - sleep disorder;
- AB - environmental problem.
- How to manage 'bruxism' problems...why are we
- making an occlusal guard?



# SLEEP MEDICINE FOR DENTISTS

A PRACTICAL OVERVIEW



EDITED BY

GILLES J. LAVIGNE, DMD, PHD

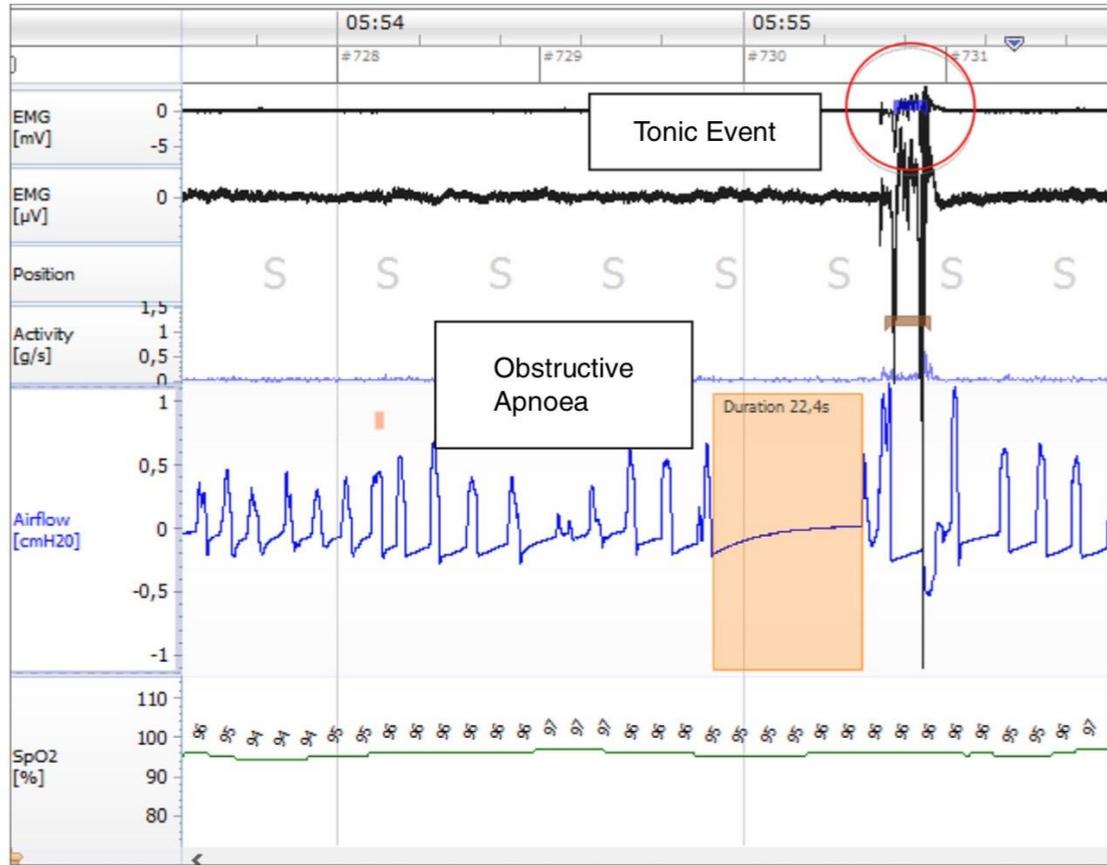
PETER A. CISTULLI, MD, PHD

MICHAEL T. SMITH, PHD

# Diagnosis (of Bruxism?)



Kato T et al, J  
Orofac Pain.  
2003;17:191-213

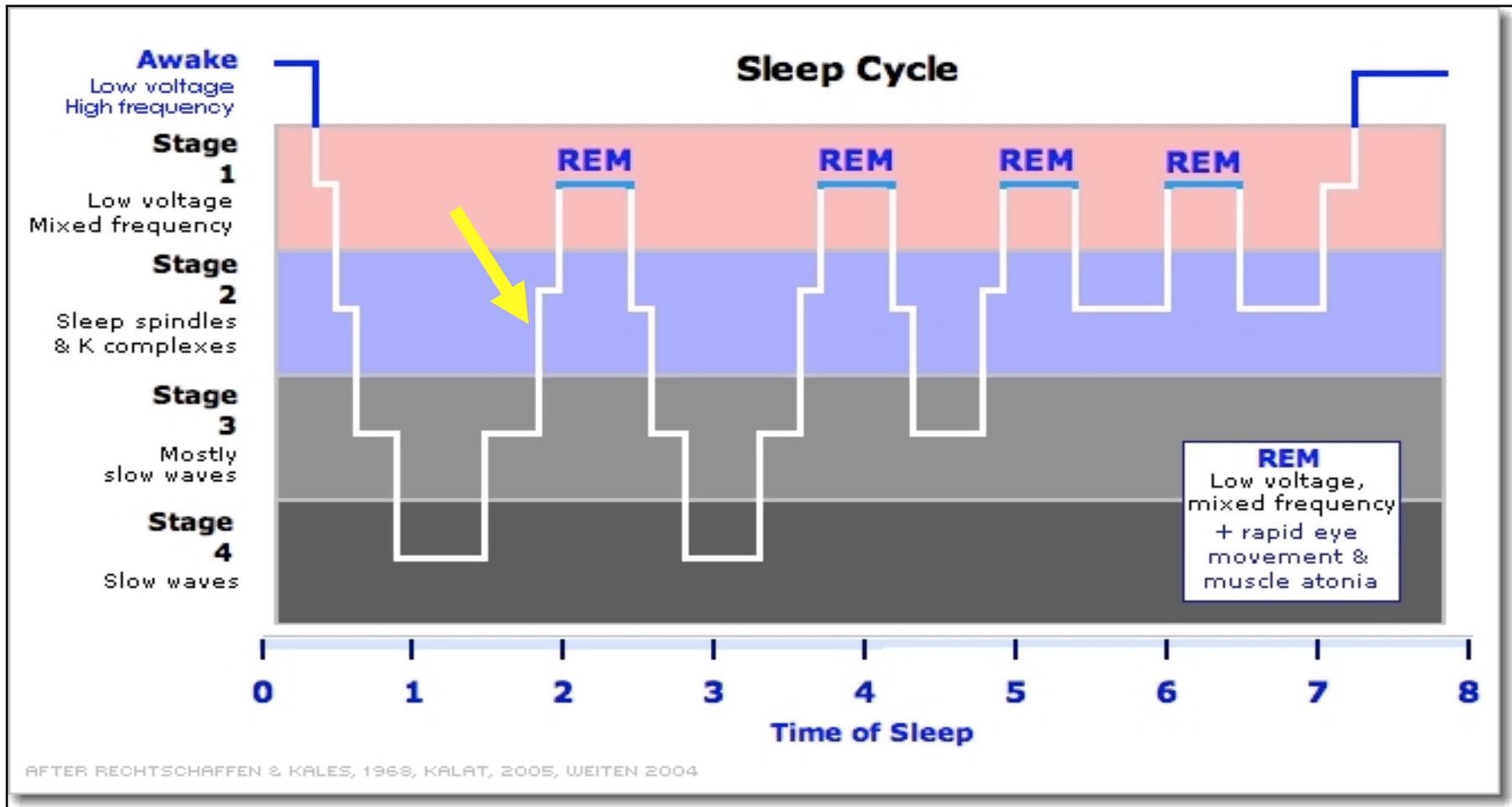


What happened??

RESPIRATORY  
 CHANGED>HEART RATE  
 INCREASED>SB BEGAN>JAW  
 MOVED INTO  
 PROTRUSIVE>AIR  
 OPENED>NORMAL  
 BREATHING

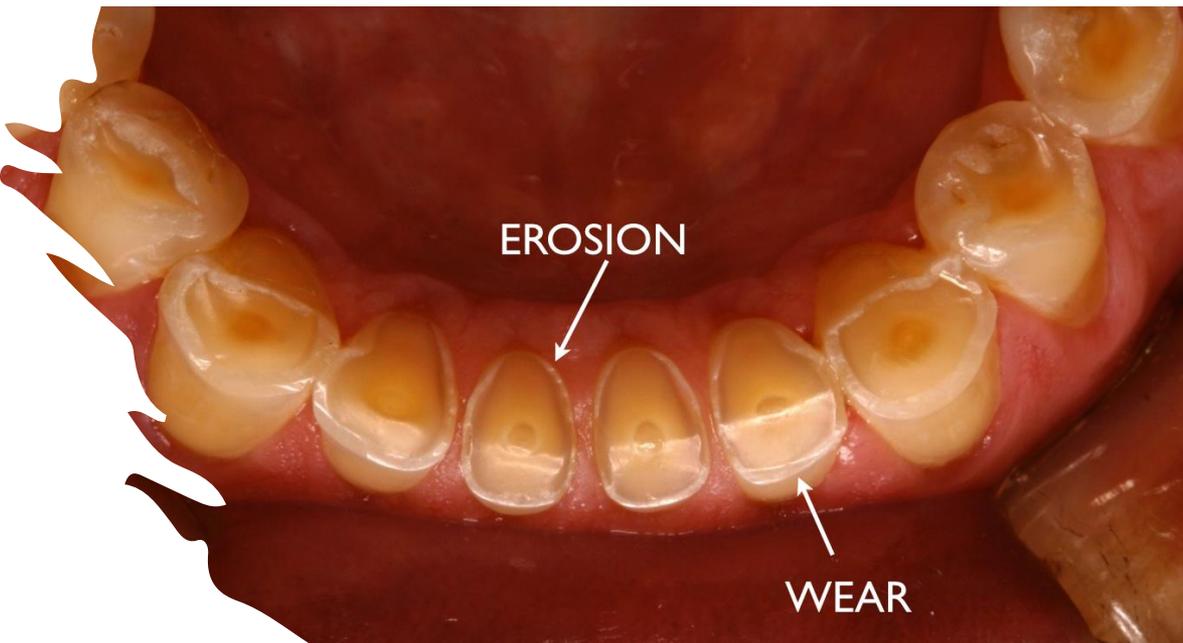
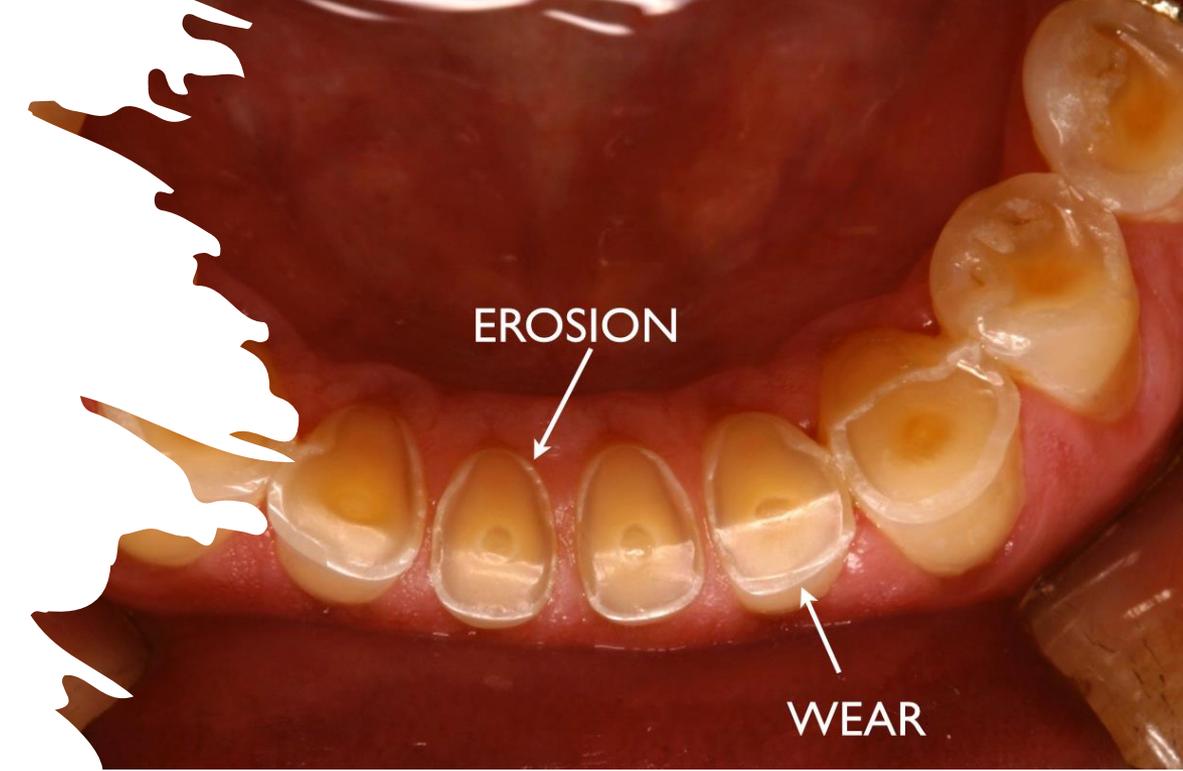
Figure 2 Example of a SB event secondary to OSAS.

Winck, et al. RevPortPneumol,2017



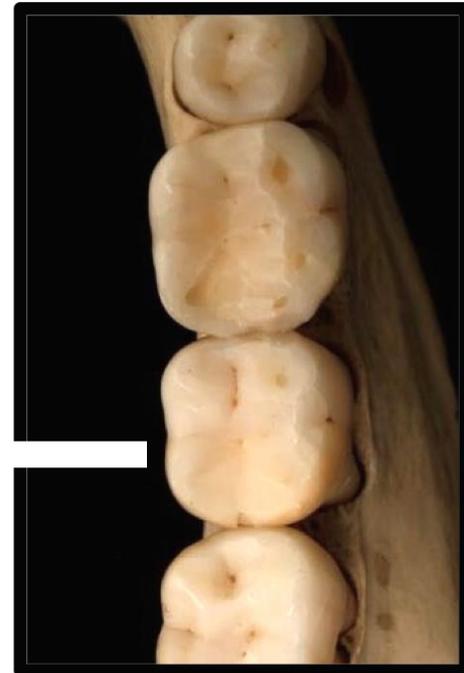
Most Sleep Bruxism takes place during transition from Stage 2 to Stage 1 sleep.

- Episodic Nature of Sleep Bruxism



# TOOTH WEAR:

Is it physiologic or pathologic??



Occlusal wear?



## PHYSIOLOGY OF SLEEP BRUXISM

```
graph TD; A[PHYSIOLOGY OF SLEEP BRUXISM] --> B[Centrally mediated]; B --> C[Triggered by changes in respiration and heart rate(ANS)]; C --> D[Related to sleep cycles];
```

Centrally mediated

Triggered by changes in respiration and heart rate(ANS)

Related to sleep cycles



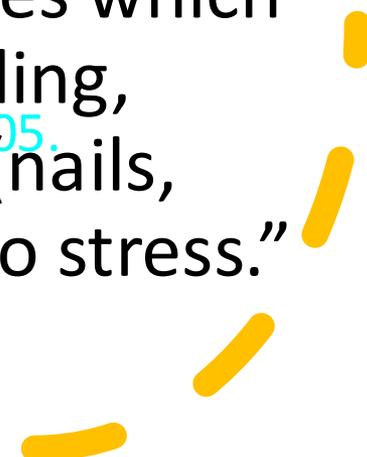
- SLEEP BRUXISM

- “Repetitive jaw muscle activity characterized by clenching or tooth grinding”

- AWAKE BRUXISM

- “Non-functional (parafunctional) activities which include clenching, grinding, tapping, biting objects (nails, pencils), often related to stress.”

American Academy Sleep Medicine, 2005.



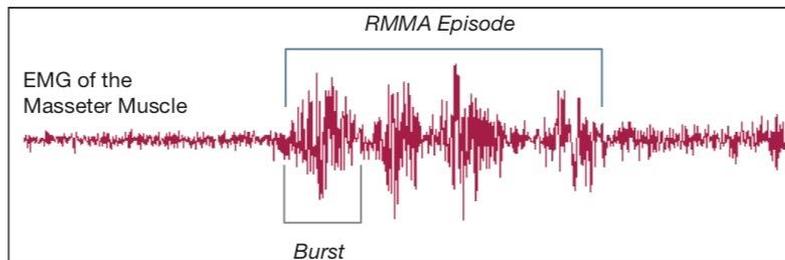
# Diagnosis of Sleep Bruxism: signs and symptoms

- Signs:
  - Tooth wear
  - Hypertrophied masseter muscles
  - Hyperkeratosis of cheeks and tongue
  - EMG/polysomnography recordings-the 'gold standard'
- Symptoms:
  - Self-reports or partner reports of noise (grinding)
  - Tooth/muscle tenderness upon arising
  - "Temporal" headaches/TMJ pain

# Sleep Bruxism (SB) vs. Awake Bruxism (AB)

SB and AB are manifestations of two distinctly different circadian forces and they differ physiologically in terms of muscle control:

- \* SB-under central control; related to sleep cycles
- \* AB-under peripheral control; related to stress, psychological and environmental impacts.



Lavigne G, JOralRehabil, 2008

# Daytime (Awake) Bruxism

- \* Often related to anxiety/stress
- \* Includes 'parafunctional' habits: clenching, tapping, nail-biting
- \* May involve higher forces than SB
- \* More easily 'self-managed' by patients (↓ stress, biofeedback)



Sleep bruxism is reported by 50% of UARS and 30% of OSA patients.

Sleep bruxism is related to micro-arousals= $\uparrow$ SB= $\uparrow$ saliva.

OSA is associated w/ GERD.

OSA and GERD both cause  $\uparrow$  in

microarousals (sleep fragmentation).

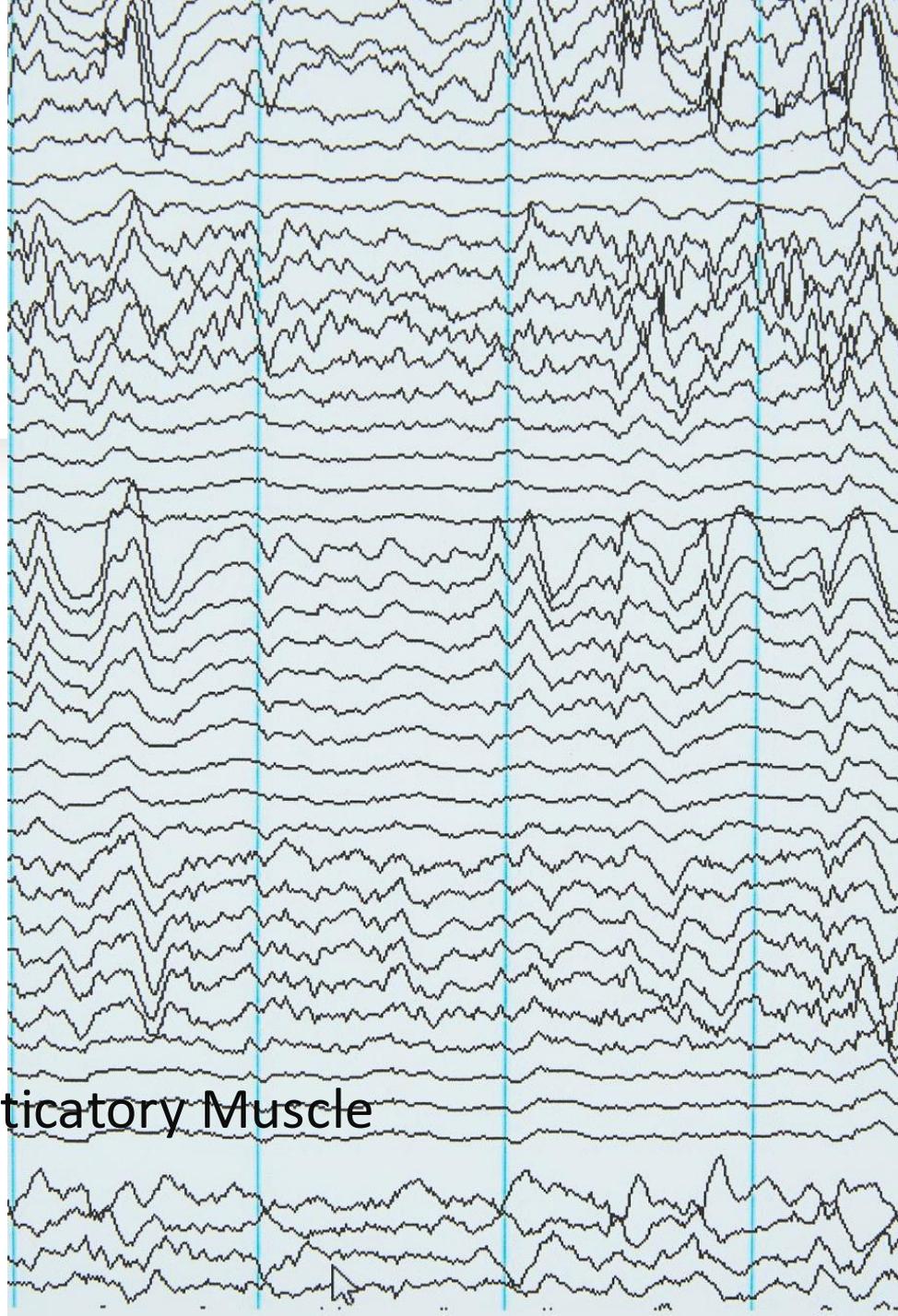
Oral pH levels are related to saliva flows

.....

# 'Cause' vs 'Effect' of Sleep Bruxism (SB)

- Cause is NOT related to occlusion.
- Cause is related to microarousals (RMMAs), which are related to Autonomic NS control:
- ↑heart rate and ↑respiration =
- ↑arousals (RMMAs).

RMMAs=Rhythmic Masticatory Muscle  
Activity



Bertazzo-  
Silveira, et  
al. JADA  
2016;147:  
859-856

- Sleep Bruxism is associated with increases of:
- 2x with alcohol consumption
- 1.5x with >8 cups coffee
- 2x with smokers

**Association between sleep bruxism and alcohol, caffeine, tobacco, and drug abuse**

A systematic review



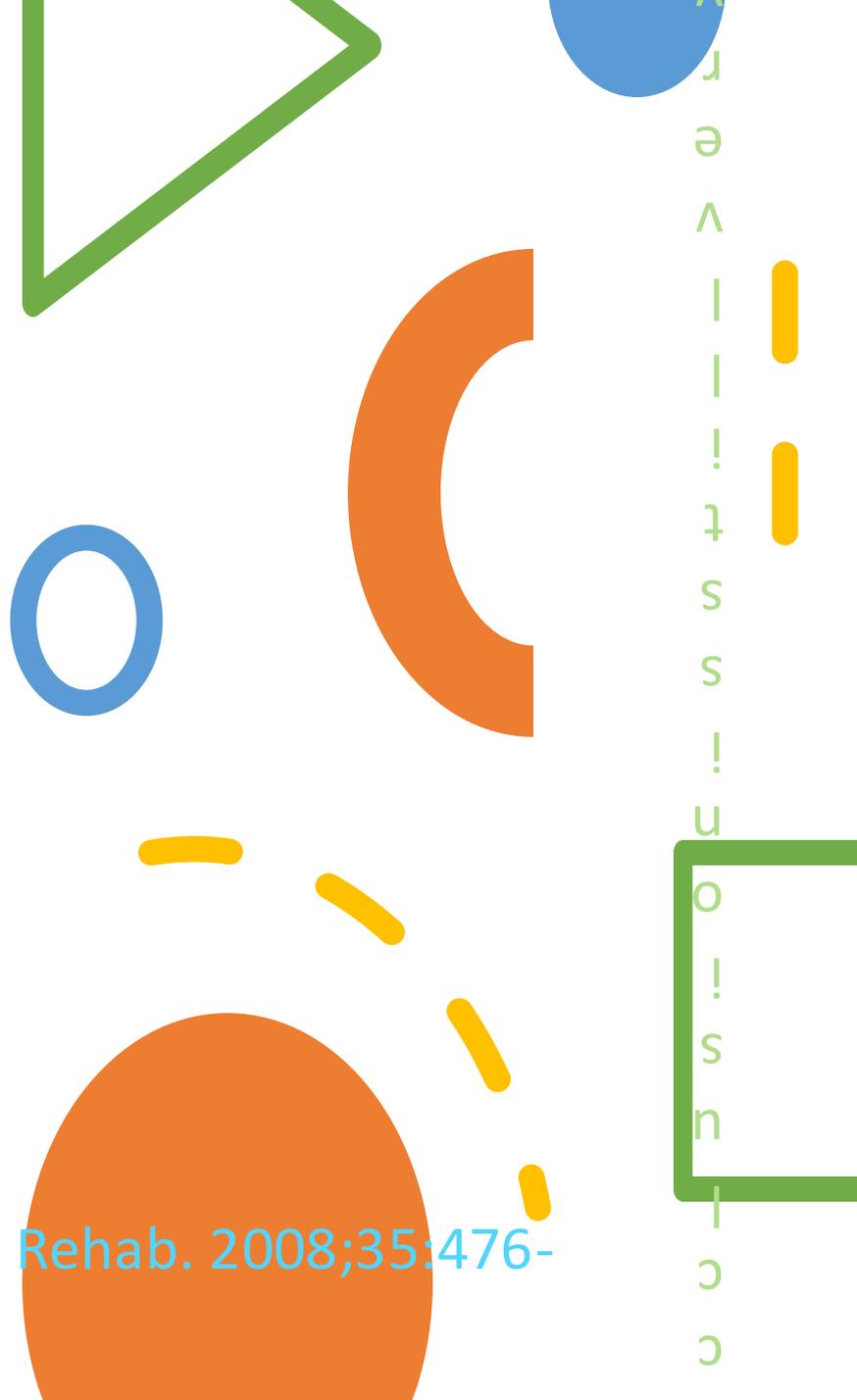
Answer:

They all disturb normal sleep patterns,  
which leads to sleep arousals.

Occlusion may be important with the “Effects” of bruxism

- Improvements in occlusion may help control the impact of bruxing (tooth fractures, mobility, hypersensitivity) and improve chewing function, but NOT help sleep bruxism.

Lavigne GJ et al, J Oral Rehab. 2008;35:476-494



# Symptoms of Sleep Bruxism

Questionnaire: Do you grind your teeth at night?

Of all self-reported bruxers, only ~50% actually showed SB

with EMG recordings!

35-50% of patients who say they are NOT bruxers actually do brux, per EMG recordings!

There are very poor correlations with other factors (AM pain, wear)....correlations do not mean causation.

# Prevalence of Sleep Bruxism

\* 14-18% of children and adolescents

\* 8% of 25-65 year olds

Today  
'br  
\* 3% of adults over 65

Thus....SB decreases with age.

[Chest. 2001;119;53-61](#)

# Treatment of SB



STANDARD TREATMENT FOR SB HAS BEEN AN OCCLUSAL STABILIZATION SPLINT (OSS), BUT A SPLINT TREATS ONLY THE EFFECTS AND NOT THE CAUSE.



THE MAIN CAUSE IS AROUSALS DURING SLEEP.



MANAGE SLEEP PROBLEMS WITH OSA TREATMENT AND CONTROL OF GERD.



WITH OSA USE OF A MANDIBULAR ADVANCEMENT APPLIANCE MAY HELP, BUT AN OCCLUSAL STABILIZATION APPLIANCE MAY MAKE OSA WORSE.

Mesko EM, et al. Systematic Reviews, 2017

Gagnon Y et al, Int J Prosth.2004;

# Occlusal Appliances



# Why do we make occlusal appliances? Are all occlusal appliances alike ?

## For treatment of:

- Wear
- Active (verified) sleep bruxism
- Awake bruxism (eg.: high stress situations)
- Prevent damage to restorations
- Possible temporomandibular joint disorders



Rosar JV, et al. Archives Oral Biol, 2017  
Singh KS, et al. JProsthDent, 2017

**Macedo CR, Silva AB, Machado MA, Saconato H, Prado GF.**  
*Occlusal splints for treating sleep bruxism (tooth grinding).*  
*Cochrane Database Syst Rev 2007; issue 4*

## The effectiveness of occlusal splints for sleep bruxism

Are occlusal splints effective in the treatment of sleep bruxism?

Aggravation of  
Respiratory  
Disturbances  
by Use of an  
Occlusal Splint  
in Apneic  
Patients:  
A Pilot Study

This open study suggested that the use of an occlusal splint is associated with a risk of aggravation of respiratory disturbances.

Ask your patients about snoring and sleep apnea when recommending an occlusal splint.

Yves Gagnon, DMD, Giles Lavigne DMD, PhD, et al, J.  
Prosthetic Dentistry

Volume 17, number 4 2004

- Maxillary occlusal devices in patients with a diagnosis of sleep apnea were;
- associated with a risk of aggravated respiratory disturbances in 40% of patients in the study. n 10. larger study required.
- Change in OVD , tongue and hyoid position may modify airway patency
- International Journal of Prosthodontics, vol . 17, number 4, 2004
- Yves Gagnon DMD, Giles Lavigne DMD, et al.

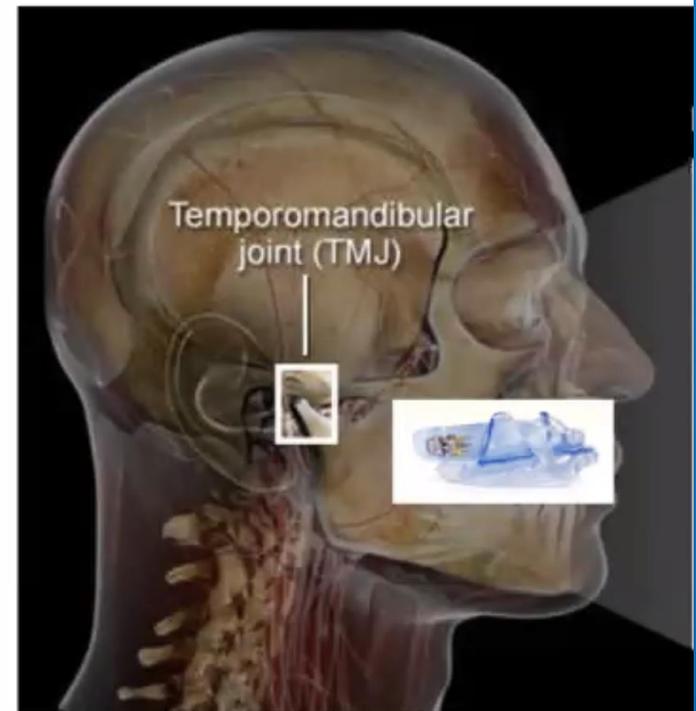


12/02/2016 16:58

# Does it Matter? Should we T

- The use of MADs (OA) may lead to the development of TMD in a small number of patients; nevertheless, these signs are most likely transient.
- The use of MADs does not significantly exacerbate TMDs in patients with pre-existing signs and symptoms of TMD. These signs and symptoms may actually decrease over time.
- The presence of signs and symptoms of TMDs is not a contraindication for the use of MADs for OSA.

Goal: Stabilize the Jaw; Prevent Posterior Superior Positioning and hold the articular disc in its correct physiologic position. Why could there be pain in AM?



Perez, CV, De Leeuw, R, Okeson, JP, Carlson, CR, Li, H-F, Bush, HM, Falace, DA; The Incidence and Prevalence of Temporomandibular Disorders and Posterior Open Bite in Patients Receiving Mandibular Advancement Device Therapy for Obstructive Sleep Apnea. *Sleep Breath* (2013) 17:323-332.

## An American Sleep Disor

### Practice Parameters for Snoring and Obstruc with Oral A

**Summary:** These clinical guidelines, which have been approved by the American Sleep Disorders Association (ASDA), provide a framework for North America with regards to the use of oral appliances for obstructive sleep apnea. A systematic assessment with methods of the Standards of Practice Committee of the ASDA has been used for the treatment of snoring and obstructive sleep apnea with oral appliances, removable—sleep apnea—snoring.

Snoring and obstructive sleep apnea (OSA), disorders that result from upper-airway obstruction, have been associated with excessive sleepiness, systemic and pulmonary hypertension, ischemic heart disease and cerebrovascular disease. Snoring also causes impaired social relationships. Oral appliances have been developed as alternatives or adjuncts to weight loss or sleep-position change, nasal continuous positive airway pressure (CPAP) and surgery for the treatment of upper-airway obstruction. The U.S. Food and Drug Administration has approved some of the available oral appliances for the treatment of snoring and without OSA, even though limited data from controlled studies supporting the effectiveness and safety of these devices have been published in peer-reviewed literature.

#### METHODS

The Standards of Practice Committee of the American Sleep Disorders Association (ASDA) appointed a

#### PRACTICE PARAMETERS

### Practice Parameters for the Treatment of Snoring with Oral Appliances: An Update for 2005

An American Academy of Sleep Medicine Report

Chia A. Guille, MD, PhD; Timothy J. Morgenthaler, MD; Michael R. Littner, MD; Cathy A. Koza, MD; Marc Westwood, PhD; Douglas Sawyer, MD; John W. Winkelman, MD; Jeffrey Lee-Chang, MD

Stanford University Center of Excellence for Sleep Disorders, Stanford, CA; (Miles J. Tan, Los Angeles Healthcare System and David Geffen School of Medicine at UCLA, Los Angeles, CA; Englewood Clinicals, Middle Tennessee State University, Murfreesboro, TN; George Washington University School of Medicine and Health Sciences, Washington, DC; Department of Medicine, New York University School of Medicine, New York, NY; Department of Pediatrics, Rhode Island Hospital, Providence, RI; 1993)

**Summary:** These practice parameters are an update of the previously published recommendations regarding use of oral appliances in the treatment of snoring and obstructive sleep apnea (OSA). Oral appliances (OAs) are indicated for use in patients with mild to moderate OSA who prefer them to continuous positive airway pressure (CPAP) therapy, or who fail treatment attempts with CPAP. Until there is higher quality evidence to suggest efficacy, CPAP is indicated whenever possible for patients with severe OSA before considering OAs. Oral appliances should be fitted by qualified dental personnel who are trained and experienced in the current care of oral health, the temporomandibular joint, dental occlusion and associated oral structures. Follow-up polysomnography or an attended cardiorespiratory (Fig 2) sleep study is needed to verify efficacy and may be needed when symptoms of OSA worsen or recur. Patients with

OSA who file will adhere to the following scenarios for OAs: Ways to use devices. Oatlist of OAs. Oatlist of OAs.

#### 1.0 INTRODUCTION

SNORING AND OBSTRUCTIVE SLEEP APNEA (OSA) ARE CAUSED IN PART BY REPETITIVE DYNAMIC OBSTRUCTION OF THE OROPHARYNGEAL AIRWAY. There is growing epidemiological and experimental evidence that OSA, and to a lesser degree snoring, are associated with a wide variety of adverse health outcomes.<sup>1</sup> OSA is considered one of several potentially treatable contributors to systemic hypertension, and has been associated with coronary artery disease, stroke, cognitive heart failure, atrial fibrillation, increased motor vehicle accident rate, sleepiness, impaired quality of life, and increased mortality. Although several epidemiologic studies suggested a relationship between snoring and hypertension, cardiovascular disease, and cerebrovascular disease, most of these studies were not able to discern the difference between primary snoring and patients with a mild variant of OSA. Nevertheless, snoring represents an important social problem, and contributes to impaired sleep quality of the bed partners of those who snore.<sup>2</sup>

#### REVIEW

### Oral Appliances for Snoring and Obstructive S

Kathleen A. Ferguson, MD; Rosalind Cartwright, PhD; Robert Ripstein, DDM; Wolfgang Guille, MD

Division of Sleep Medicine, University of Western Ontario, London, Ontario, Canada; Channing D. Department of Dental Medicine, St. Barnabas Medical Center, Livingston, NJ, USA; Dallas, TX

**Abstract:** We conducted an evidence-based review of literature regarding use of oral appliances (OAs) in the treatment of snoring and obstructive sleep apnea syndrome (OSA) from 1995 until the present. Our structured search revealed 141 articles for systematic scrutiny, of which 67 were suitable for inclusion in the evidence base. Including 15 Level 1 to 3 randomized controlled trials and 5 of these trials with parallel-controlled treatment. The efficacy of OAs was considered for controlling OSA in some but not all patients with success (defined as no more than 10 apneas or hypopneas per hour of sleep) achieved in an average of 52% of treated patients. Effects on sleepiness and quality of life were also documented, but improvements in other neurocognitive outcomes were not consistent. The mechanism of OAs therapy is related to opening of the upper airway as demonstrated by imaging and physiologic monitoring. Treatment adherence is variable with patients reporting using the appliance a median of 77% of nights at 1 year. Minor adverse effects were frequent, whereas major adverse effects were uncommon. Minor tooth movement and small

#### 1.0 INTRODUCTION

THE STANDARDS OF PRACTICE COMMITTEE (SPC) IS CHARGED BY THE AMERICAN ACADEMY OF SLEEP MEDICINE (AASM) TO PRODUCE TOPICAL reviews and clinical guidelines and practice parameters for the use of clinicians. The Committee embraces the principles of evidence-based medicine including standardized methods for literature review and criterion-based ratings of research quality. The methods are consistent with guideline development methodology advocated by the American Medical Association (AMA). The AMA has certified previous guidelines for meeting their quality criteria. In 1995, the then American Sleep Disorders Association (now the AASM) and its SPC produced a practice parameter regarding oral appliances (OAs) use for snoring and obstructive sleep apnea (OSA).<sup>1</sup> In 2002 the AASM SPC created a task force to update the literature review in preparation for updating the related practice parameters regarding OAs for OSA. The charge to the task force was to focus on new developments since 1995 and to seek specific

Disclosure Statement

#### SPECIAL ARTICLES

### Clinical Practice Guideline for the Treatment of Obstructive Sleep Apnea and Snoring with Oral Appliance Therapy: An Update for 2015

An American Academy of Sleep Medicine and American Academy of Dental Sleep Medicine Clinical Practice Guideline

Karen M. Ploner, MBBS, PhD; Leslie C. Dort, DDS; Sheri G. Katz, DDS; Christopher J. Lethier, MD; Christopher O. Martin, MD; Shireen M. Thomas, PhD; Ronald D. Chervin, MD

Katey Clark, Rochester, MN; University of Calgary, Calgary, Alberta, Canada; Atlanta, GA; Walter Reed National Military Medical Center, Bethesda, MD; Massachusetts Academy of Sleep Medicine, Canton, MA; University of Michigan, Ann Arbor, MI

**Introduction:** Since the previous parameter and review paper publication on oral appliances (OA) in 2006, the relevant scientific literature has grown considerably, particularly in relation to clinical outcomes. The purpose of this new guideline is to replace the previous and update recommendations for the use of OAs in the treatment of obstructive sleep apnea (OSA) and snoring.

**Methods:** The American Academy of Sleep Medicine (AASM) and American Academy of Dental Sleep Medicine (AADSM) commissioned a review of the literature. A systematic review of the literature was performed and a modified grading of Evidence-Based Assessment, Synthesis, and Evaluation (GRADE) process was used to assess the quality of evidence. The task force developed recommendations and assigned strengths based on the quality of the evidence corroborated by an assessment of the relative benefits of the treatment versus the potential harms. The AASM and AADSM Board of Directors approved the final guideline recommendations.

#### Recommendations:

1. We recommend that sleep physicians prescribe oral appliances, rather than no therapy, for adult patients who request treatment of primary snoring without obstructive sleep apnea (STANDARD)
  2. When oral appliance therapy is prescribed by a sleep physician for an adult patient with obstructive sleep apnea, we suggest that a qualified dentist use a custom, titratable appliance over non-custom oral devices. (GUIDELINE)
  3. We recommend that sleep physicians consider prescription of oral appliances, rather than no treatment, for adult patients with obstructive sleep apnea who are intolerant of CPAP therapy or prefer alternative therapy. (STANDARD)
  4. We suggest that qualified dentists provide overnight—rather than no follow-up—of oral appliance therapy in adult patients with obstructive sleep apnea, so therapy for dental-related side effects or occlusal changes and reduce their incidence. (GUIDELINE)
  5. We suggest that sleep physicians conduct follow-up sleep testing to measure or confirm treatment efficacy, rather than conduct follow-up without sleep testing, for patients fitted with oral appliances. (GUIDELINE)
  6. We suggest that sleep physicians and qualified dentists consider follow-up sleep testing with oral appliances for obstructive sleep apnea to return for periodic office visits—on an as-needed basis—rather than a qualified dentist and a sleep physician. (GUIDELINE)
- Conclusions:** The AASM and AADSM expect these guidelines to have a positive impact on professional behavior, patient outcomes, and, possibly, health care costs. This guideline reflects the state of knowledge at the time of publication and will require updates if new evidence warrants significant changes to the current recommendations.
- Keywords:** obstructive sleep apnea, snoring, oral appliances, mandibular advancement, positive airway pressure.
- Correspondence:** Karen M. Ploner, MD, PhD, University of Michigan, 1600 East Calder Road, Ann Arbor, MI 48106-0616. (E-mail: kploner@umich.edu)

#### SUMMARY

Since the publication of the initial position statement by the American Academy of Sleep Medicine and American Academy of Dental Sleep Medicine in 2006, the scientific literature on OAs has grown considerably, particularly related to clinical outcomes after use of OAs. The purpose of

# TMD not a contraindication !

1995

2005

2006

2015

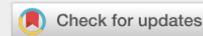
Literature Review

# Is there any association between sleep disorder and temporomandibular joint dysfunction in adults? – A systematic review

Amanda Tereza Pala Mendes, DDS , Juliana Dias Corpa Tardelli, MS , André Luís Botelho, PhD & [Andréa Cândido Dos Reis](#) , PhD

Pages 426-437 | Published online: 20 Dec 2022

 Cite this article  <https://doi.org/10.1080/08869634.2022.2154022>



## Conclusion

The association of sleep bruxism with TMD is controversial. While, for obstructive sleep apnea, insomnia, snoring, and gastroesophageal reflux, the analyzed studies showed a positive association.

## KEYWORDS:

Temporomandibular joint dysfunction

sleep disorders

systematic review

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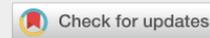
Editorial

# A personal perspective on the association between bruxism and dental occlusion

Frank Lobbezoo , DDS, PhD 

Pages 369-370 | Published online: 16 Jan 2025

 Cite this article  <https://doi.org/10.1080/08869634.2025.2453378>



The persistent belief in occlusal adjustments for managing bruxism [5] underscores the need for better education among dental practitioners. Understanding the multifactorial aetiology of bruxism and TMD is crucial for providing effective treatment and maintaining oral health-related quality of life. In conclusion, the evolving understanding of bruxism highlights the importance of considering central and multifactorial influences over occlusal factors. While occlusion may not be a primary cause of bruxism, the condition's potential negative health outcomes necessitate careful management. Importantly, dental practitioners must stay informed about the latest research to provide evidence-based care and improve patient outcomes.



*[www.AlilaMedicalMedia.com](http://www.AlilaMedicalMedia.com)*





Of course he's cute

OthOf courThodof

# Myofunctional Therapy

Proper  
Lip Seal

Tongue  
Posture

Nasal  
Breathing

Swallowing  
Pattern



Questions?



# Break Time





# Red Flags of the TMD Exam





## Anxiety/Disturbed Sleep

- BE AWARE
- of the
- **RED FLAGS**
- during the
- TMD EXAM

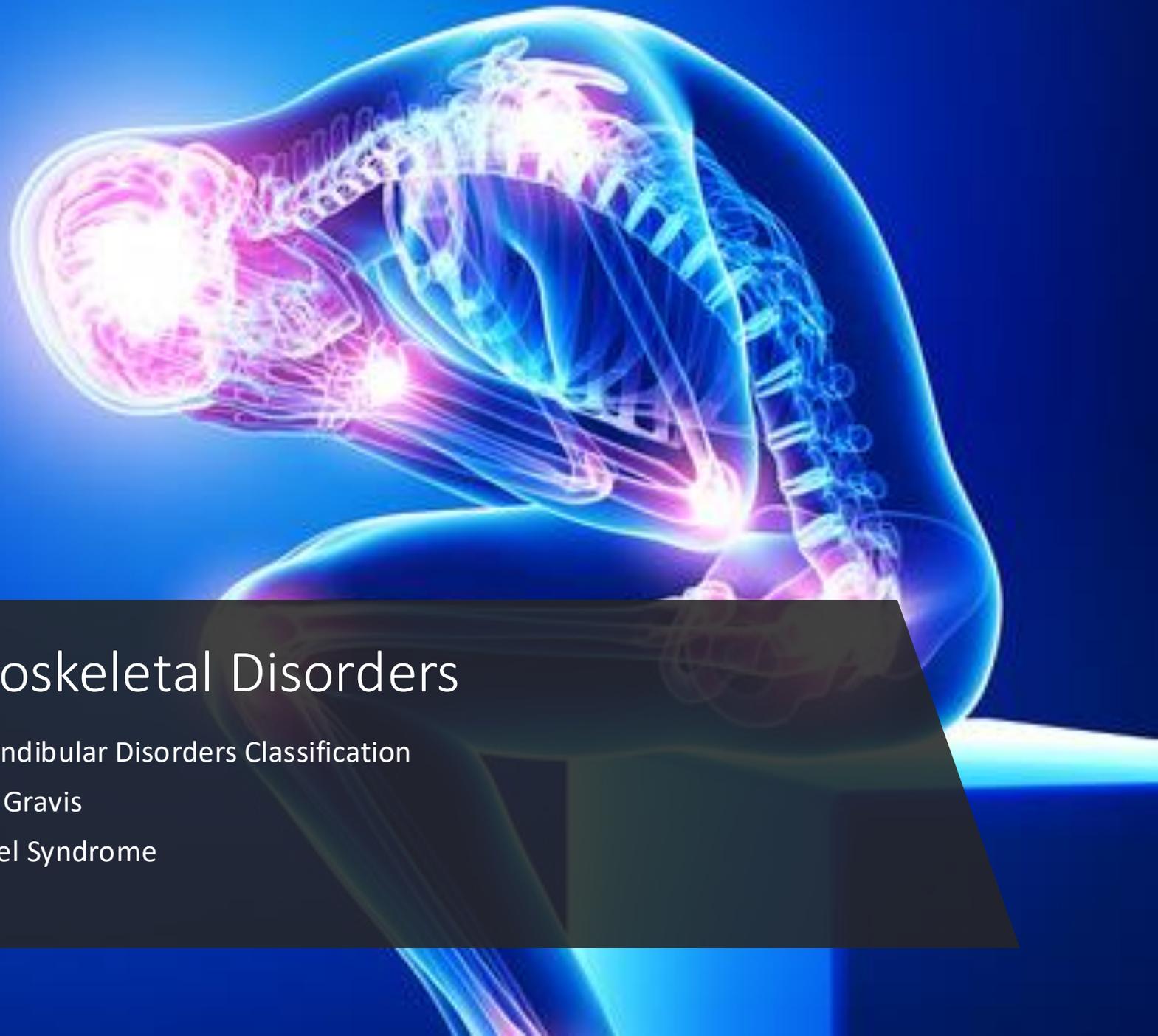
# TMD Update

## Do I Have TMJ?

Signs & Symptoms  
of TMJ Disorder/TMD



- Temporomandibular disorders (TMD) is
- a collective term that embraces a number
- of clinical conditions that involve :
  - the masticatory musculature and /or
  - the temporomandibular joints and
  - associated structures.



# Musculoskeletal Disorders

- Temporomandibular Disorders Classification
- Myasthenia Gravis
- Carpel tunnel Syndrome

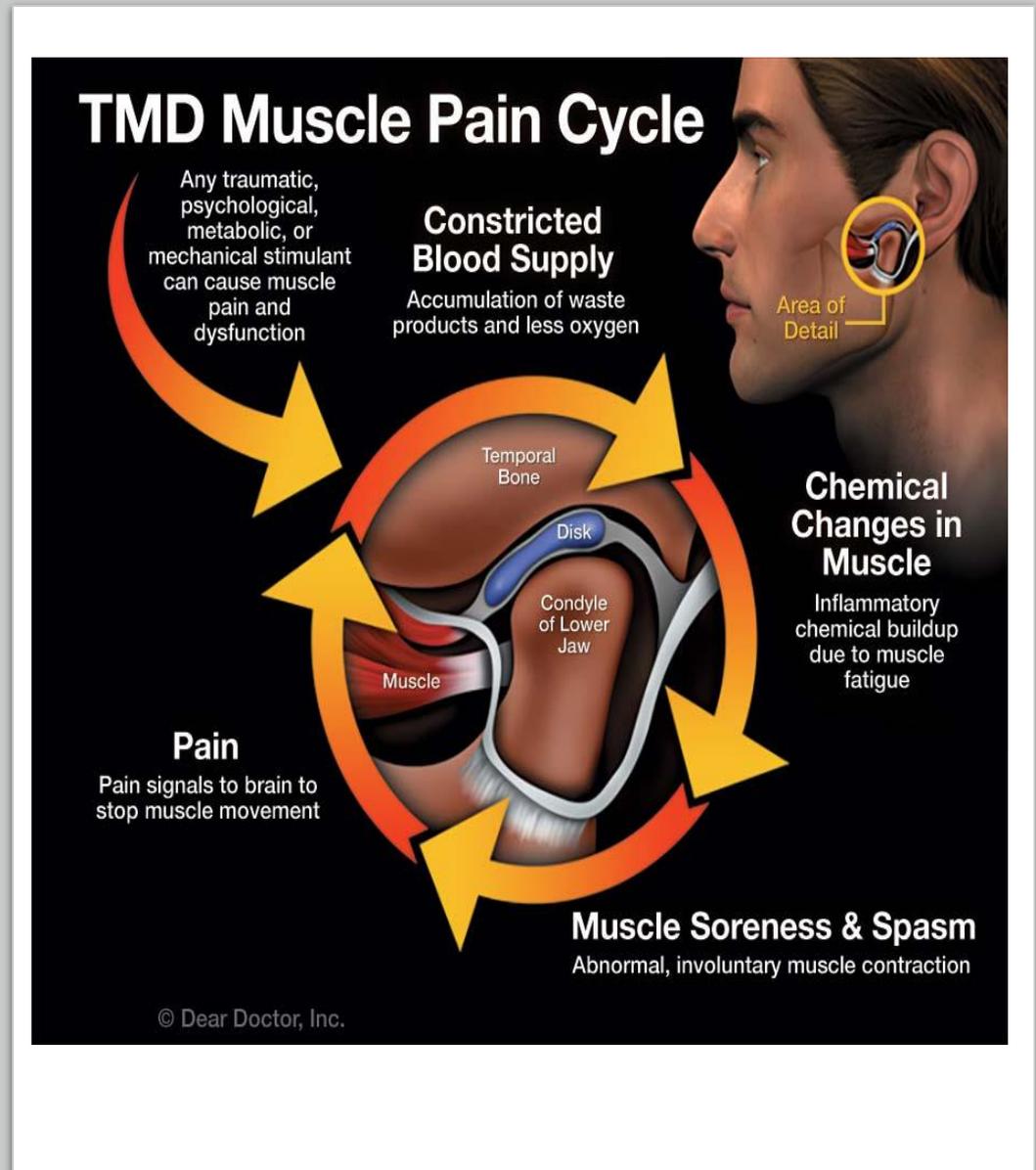


## Signs of TMD

- 
- Epidemiological studies report that
- approximately 75% of the population
- has at least one SIGN of
- Temporomandibular disorder.
  - TMJ noise
  - Mandibular deviation
  - Facets / Abfractions

# Symptoms of TMD

- Approximately 33% of the population
- has at least one SYMPTOM of
- Temporomandibular disorder.
  - Face pain
  - Jaw pain
  - Tinnitus

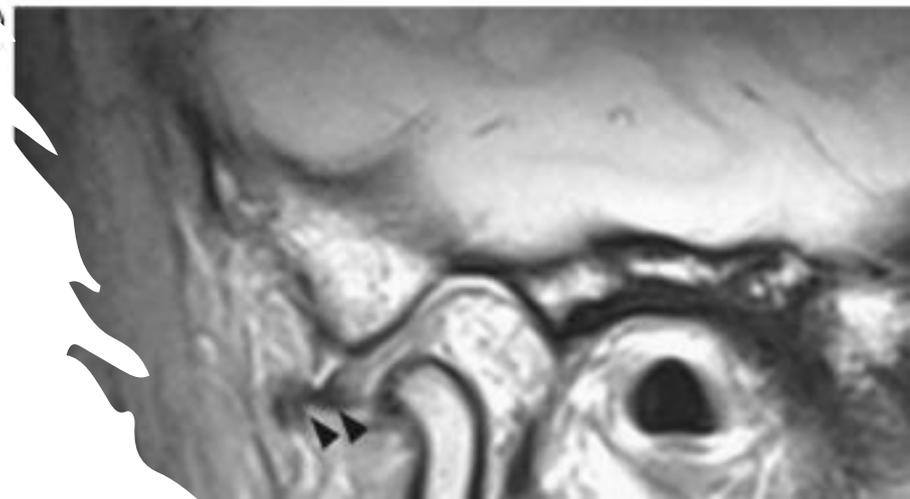
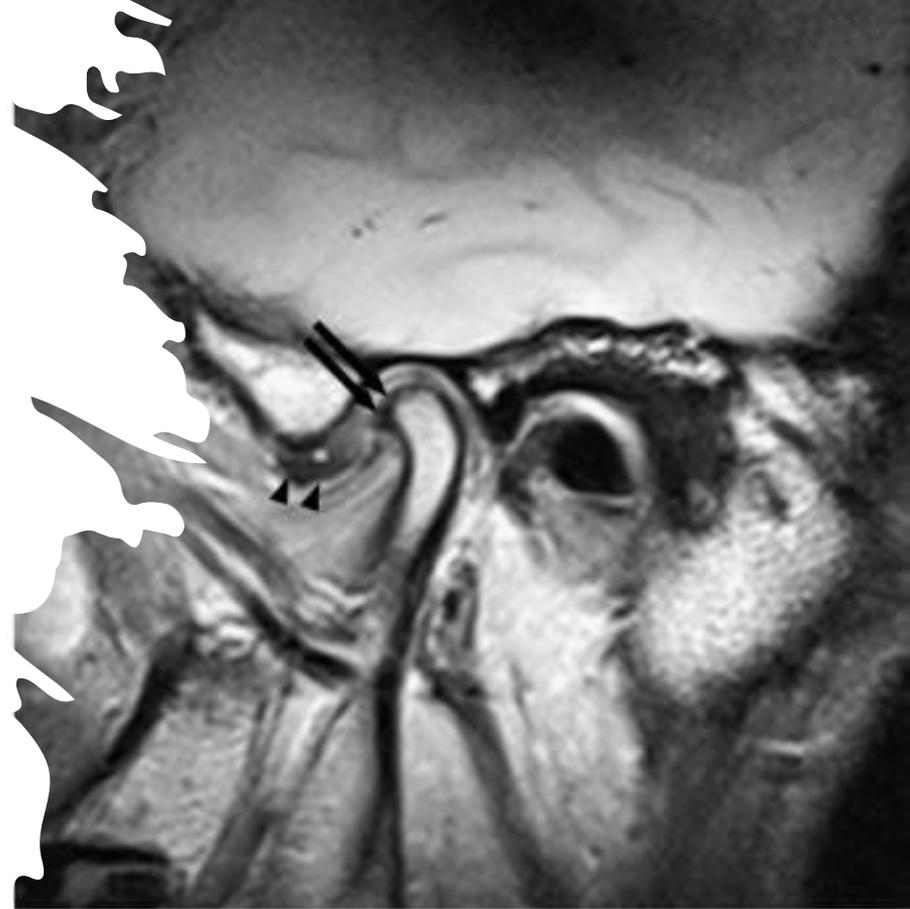


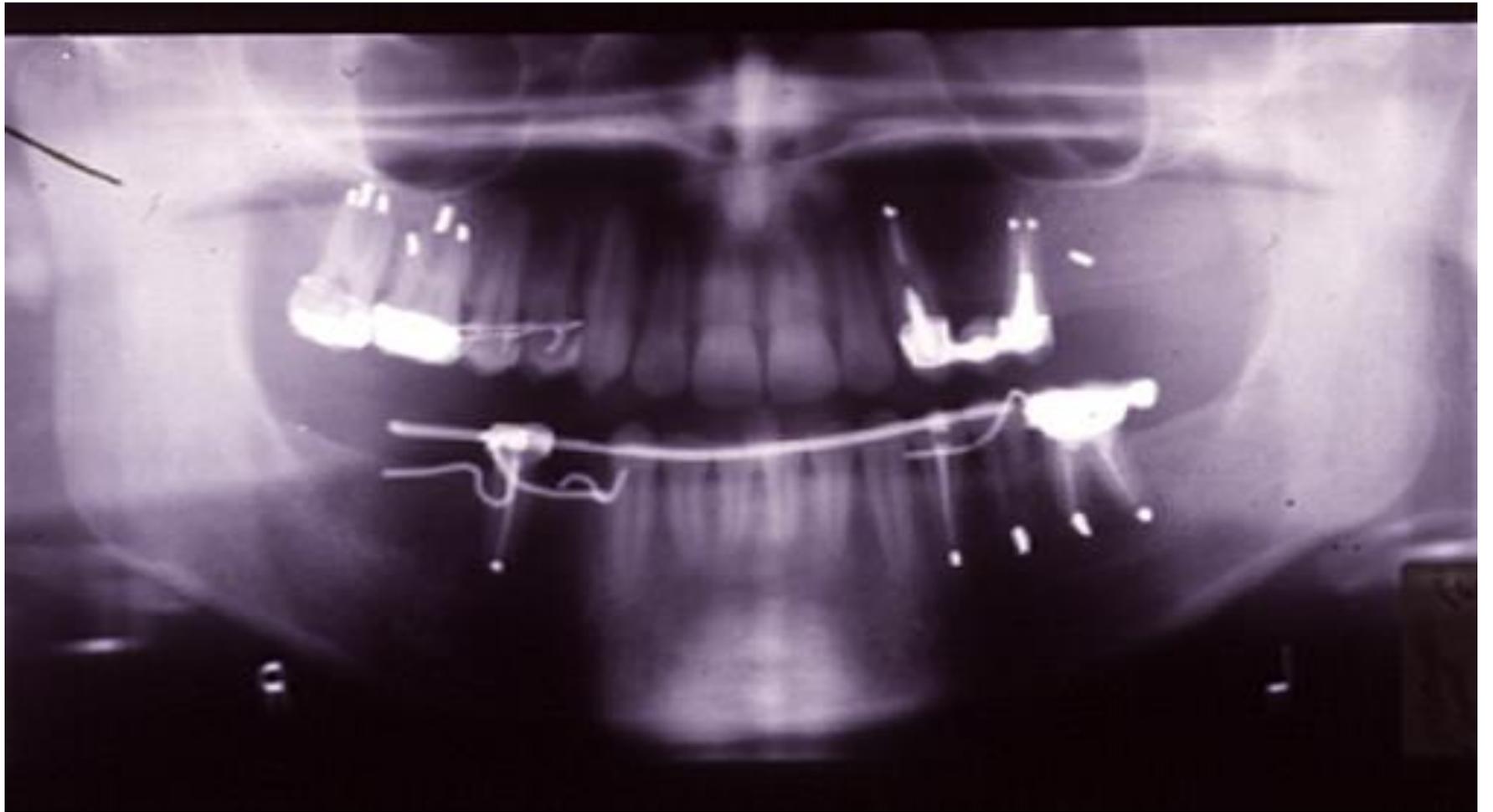
# Who Needs Treatment

- Approximately 5 to 6% of those who have signs and/or symptoms are in need of or actually seek care.
- Recent clinical figures report a ratio of approximately 4:1 of females to males seeking care for TMD.

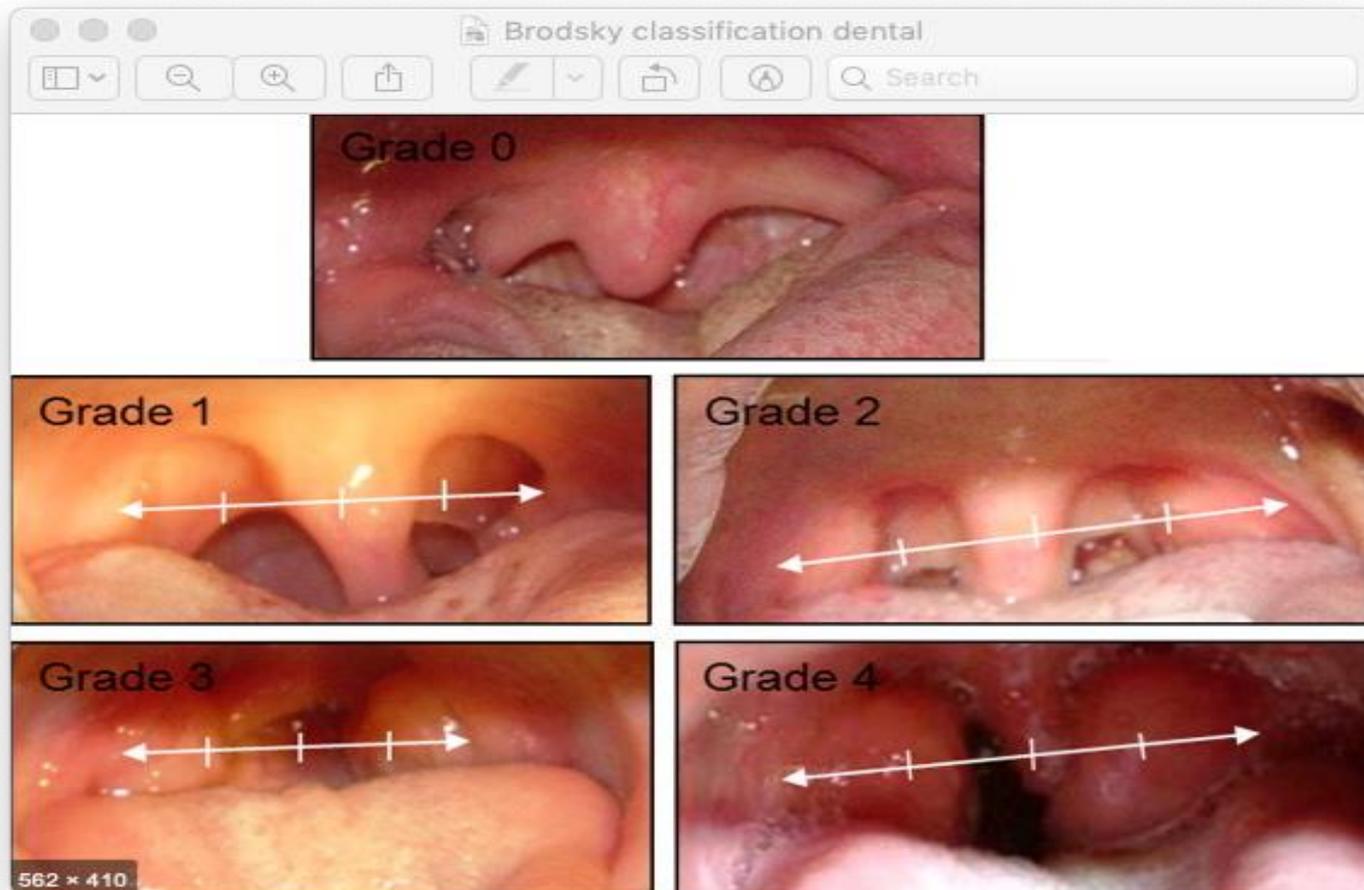
Australia Study:

Estrogen Receptor Site

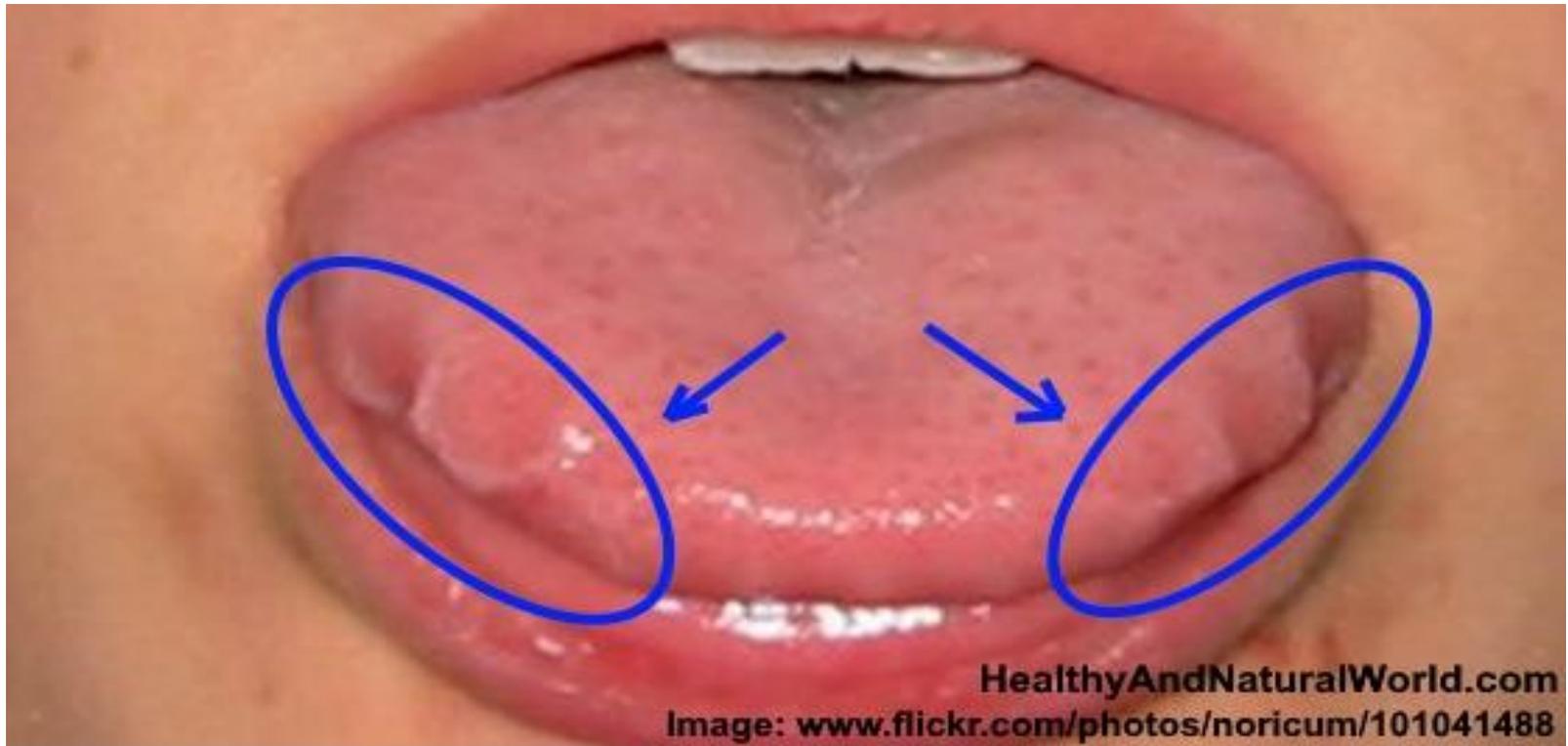




# Brodsky Classification/Tonsils



# Scalloped Tongue

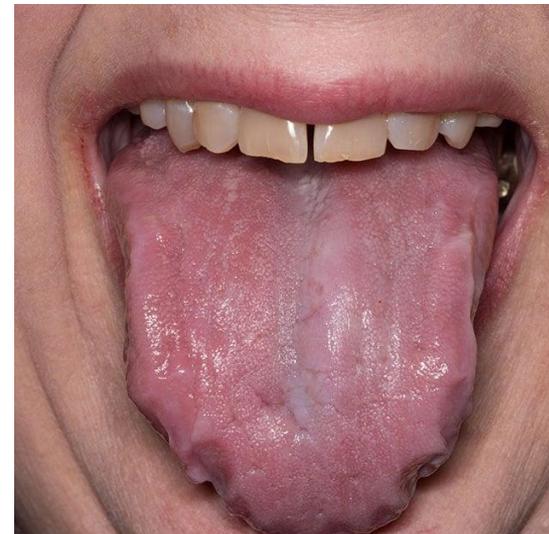
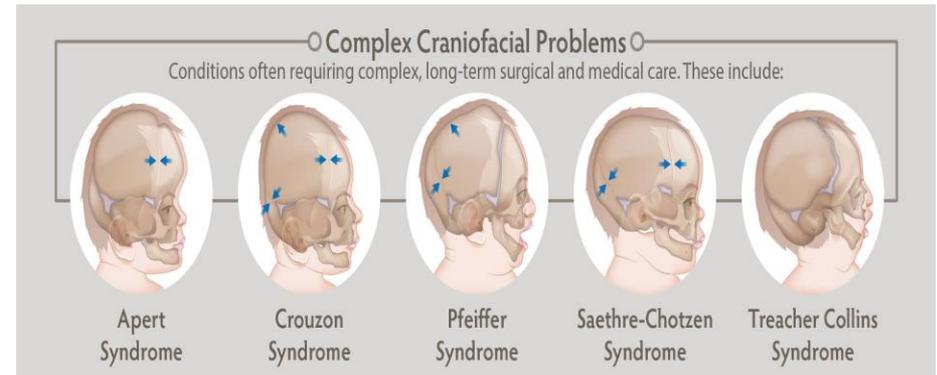


HealthyAndNaturalWorld.com

Image: [www.flickr.com/photos/noricum/101041488](http://www.flickr.com/photos/noricum/101041488)

# Scalloped Tongue Etiology

- Downs Syndrome
- Hypothyroid
- Apert Syndrome
- Amyloidosis
- Sleep apnea
- Parafunctional Activity



# Mallampati Index

## Mallampati Classification



Class 1

Class 2

Class 3

Class 4

Class 1; soft palate, fauces, uvula, pillars

Class 2; soft palate, fauces, portion of uvula

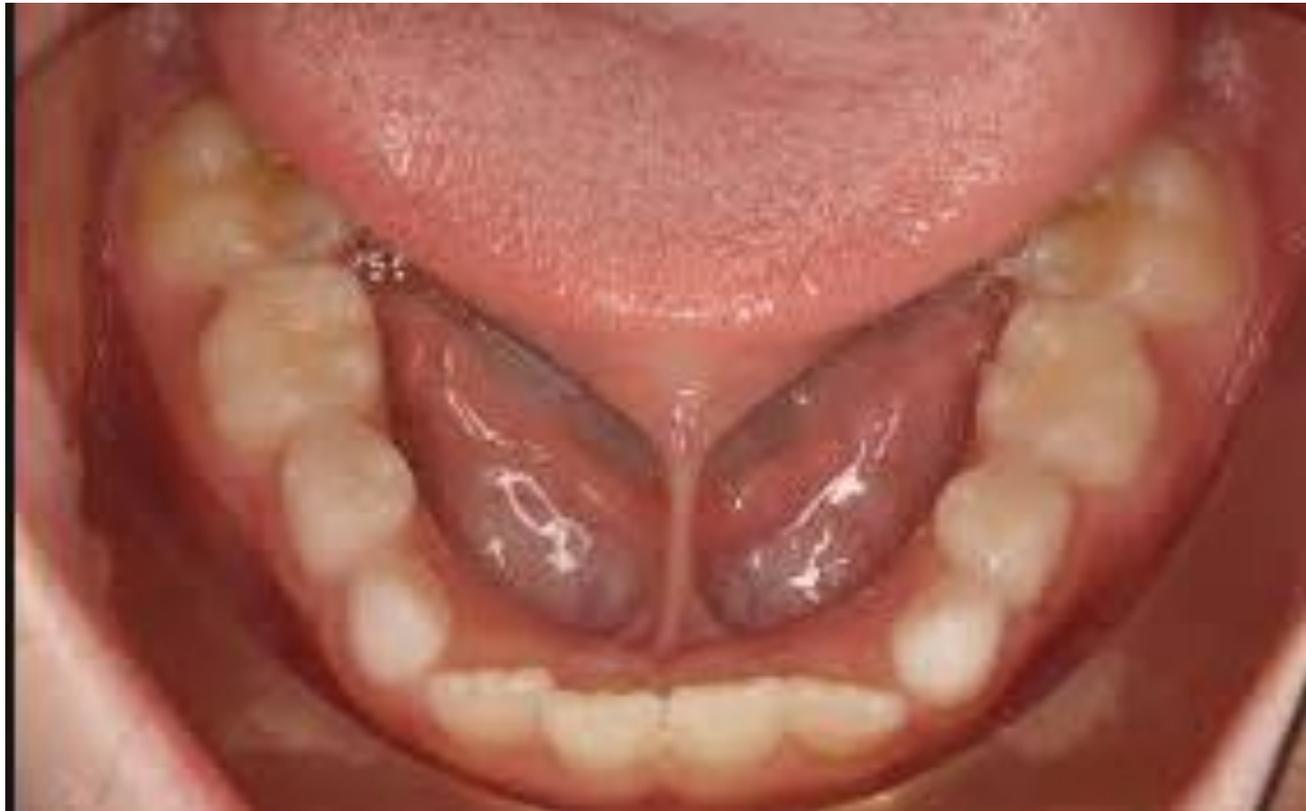
Class 3; soft palate, base of uvula

Class 4; hard palate only

# Mallampati Score / OSA

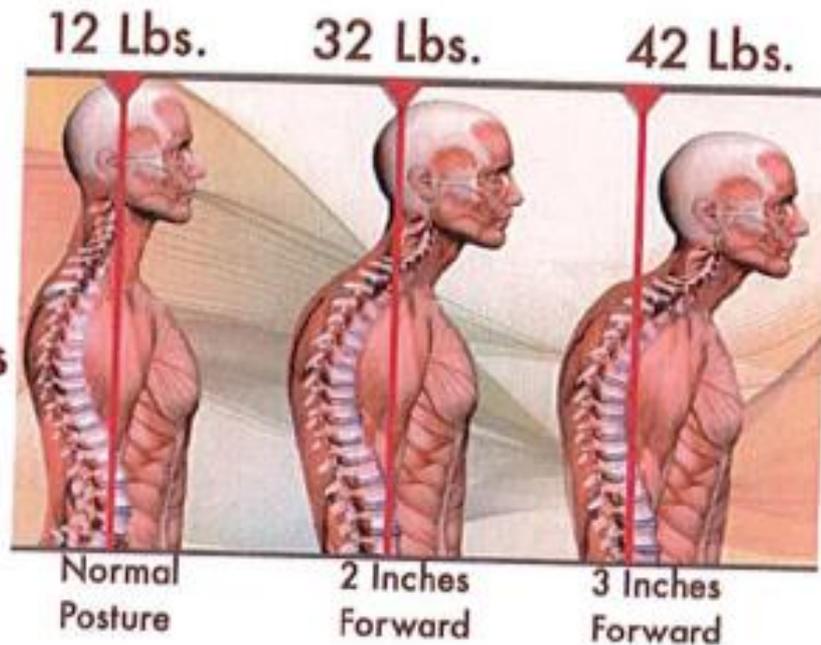
- One point increase in Mallampati score results in 5 additional AHI events per /hr
- One point increase adds 2 fold chance for OSA
- These findings are irrespective of BMI, airway anatomy or medical history
  
- SLEEP 2006:29(7): 903-908
  
- What is AHI you may ask?

# Short Lingual Frenum



# THE 42 POUND HEAD!

Every inch the head moves forward of the shoulders amplifies its weight by 10 pounds.



The cervical extensors must isometrically battle these 42 pounds against the relentless force of gravity.



See all



1 [a 0]

$\tan h^{-1} x = \frac{1}{2} \ln \left| \frac{1+x}{1-x} \right|$

$\frac{d}{dx} \ln \left| \frac{1+x}{1-x} \right| = \frac{1}{1+x} + \frac{1}{1-x} = \frac{1-x+1+x}{(1+x)(1-x)} = \frac{2}{1-x^2}$

$\int \frac{1}{1-x^2} dx = \frac{1}{2} \ln \left| \frac{1+x}{1-x} \right| + C$

# Paradigm Shifts in our General Practice

EUGENE SANTUCCI,  
DDS,MA, FACD



# Pediatric Dentistry

- Is it Just About Decay
- Let's Expand the Paradigm of Evaluation and Treatment



# Internalizing symptoms and sleep disturbances associated with sleep bruxism in preschoolers

Christine Laganière<sup>a b c</sup>, Nelly Huynh<sup>d</sup>, Samantha Kenny<sup>a c</sup>, Hélène Gaudreau<sup>b</sup>, Irina Pokhvisneva<sup>b</sup>, Michael Meaney<sup>b e</sup>, Marie-Hélène Pennestri<sup>a c</sup>  

# Why Do Kids Grind Their Teeth?



Stress



Anxiety



Dental issues

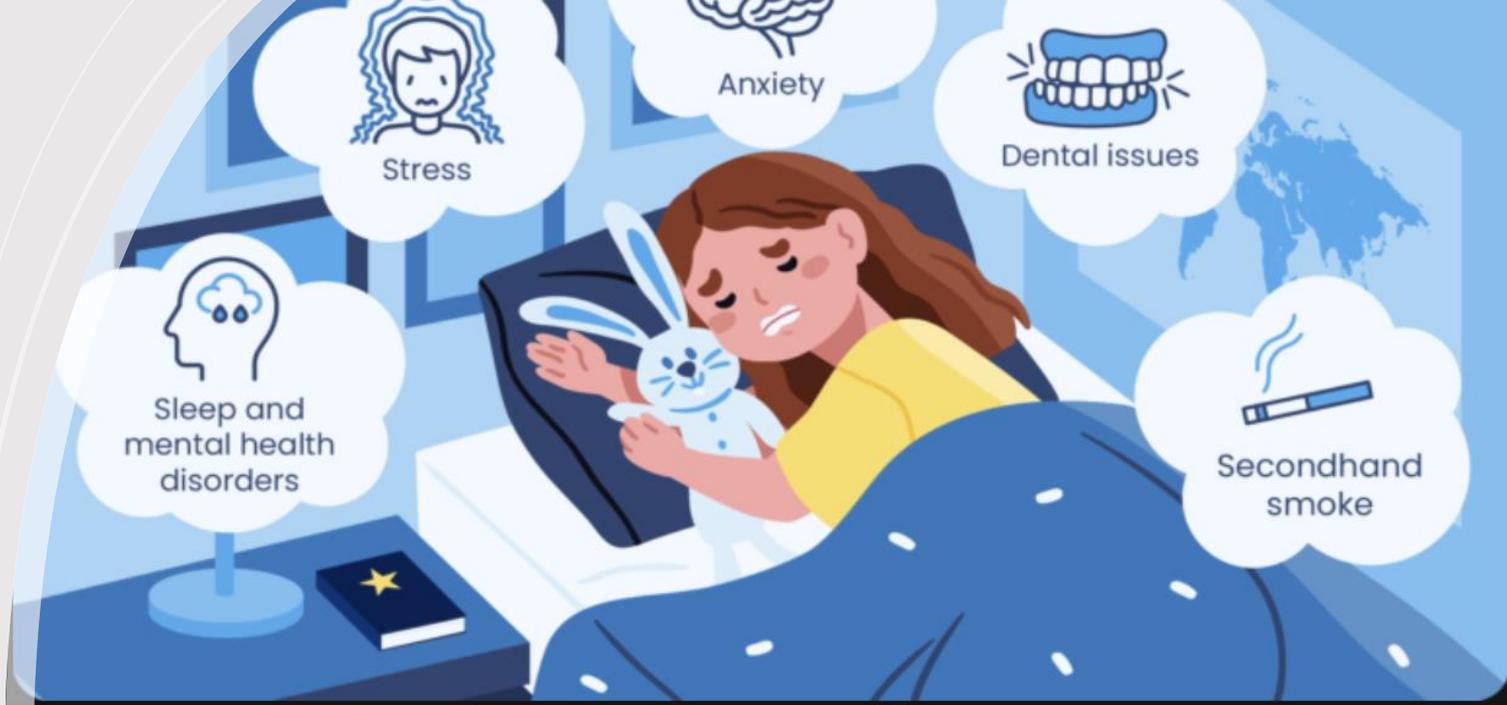


Sleep and  
mental health  
disorders

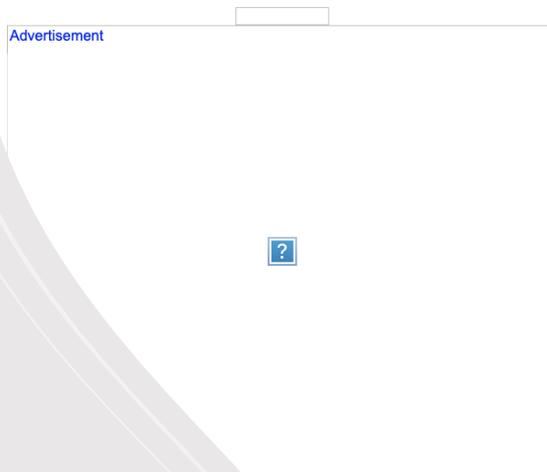


Secondhand  
smoke





## Research & Innovation



### Study Links Sleep Bruxism In Children To Internalizing Symptoms

[DrBicuspid](#) (5/14) reported that a [study](#) published in Sleep Medicine suggests sleep bruxism (SB) in children as young as four may be associated with suppressing symptoms of depression and anxiety. The research, led by Christine Laganière of McGill University, involved 340 mother-child pairs and used the Children's Sleep Habits Questionnaire to assess SB frequency. After controlling for various factors, frequent SB episodes were significantly linked to increased depressive and anxiety problems. The

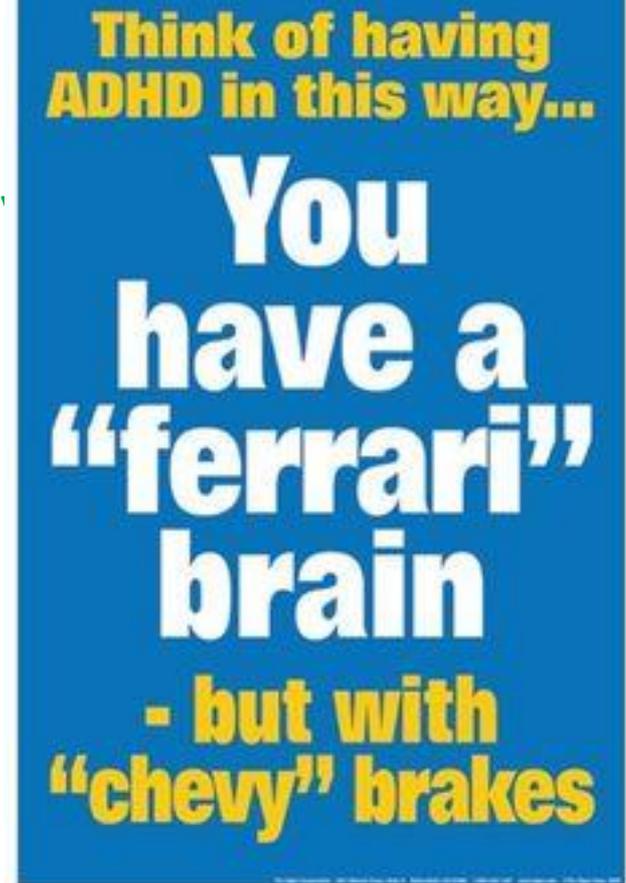
... a multidisciplinary approach to address SB and associated internalizing

# Prevalence of Sleep Disorders in Children and Adolescents

- 25% have some form of sleep disorder
- 3-12% exhibit snoring
- 20% occasional, 10% habitual
- 1-3% exhibit OSA
- 12-33% are just poor sleepers

# Attention Deficit/Hyperactivity

- ADHD is a term used to describe hyperactivity, inattentiveness, and /or impulsivity.
- Common condition that begins in childhood and may persist into adulthood.
- Children with ADHD have trouble sitting still, staying focused and controlling their behavior and emotions, this can lead to lower social skills, isolation, and poor school performance.



# What can be Done



- Parents, start observing your children while they sleep, from birth onwards
- All care givers should be a part of the team
- Kids need restorative sleep, if interrupted
- Daily fatigue, sleepiness, cognitive impairment, poor school performance and behavioral changes may occur

Bonuck et al, Intellectual and Developmental Disabilities 2012, vvi,50,41-52



# Overview of ADHD

- The cause of ADHD in children is not definitively known but some possibilities are that's its genetic, resulting from brain injury due to decreased oxygen levels and sleep disturbed breathing.
- Present treatment involves psycho stimulants to help with focus and organization (Ritalin and Adderall)
- Special classes/ home schooling



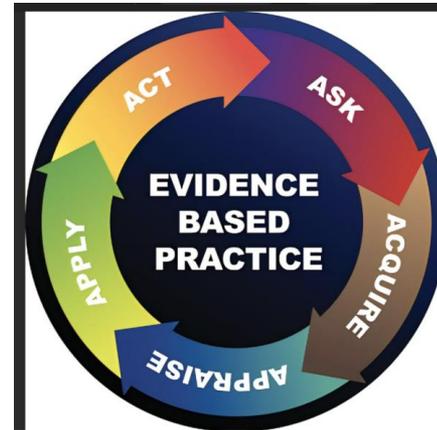
# Negative Information

- If you suspect you or your child may have disordered breathing or ADHD symptoms don't accept;
- Pain problems don't go away
- You don't need a frenulum release
- ADHD is a disease, it won't go away
- Orthodontics /dental appliances won't help
- We'll just watch the tonsils/adenoids
- Jaw is too narrow, extract several permanent teeth

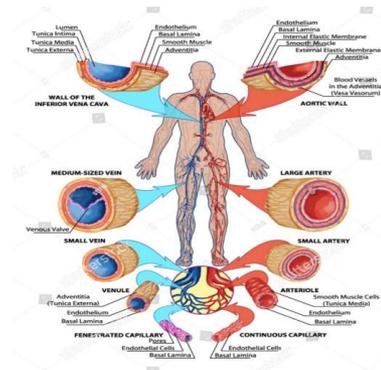


# Evidence Based Association of Pediatric OSA

- Poor school performance
- Enuresis
- Failure to thrive
- Learning disabilities
- Obesity
- ADD/ Hyperactivity
- AHI for Children – Adolescents
  - 1-4 mild 5-10 moderate >10 severe
- 

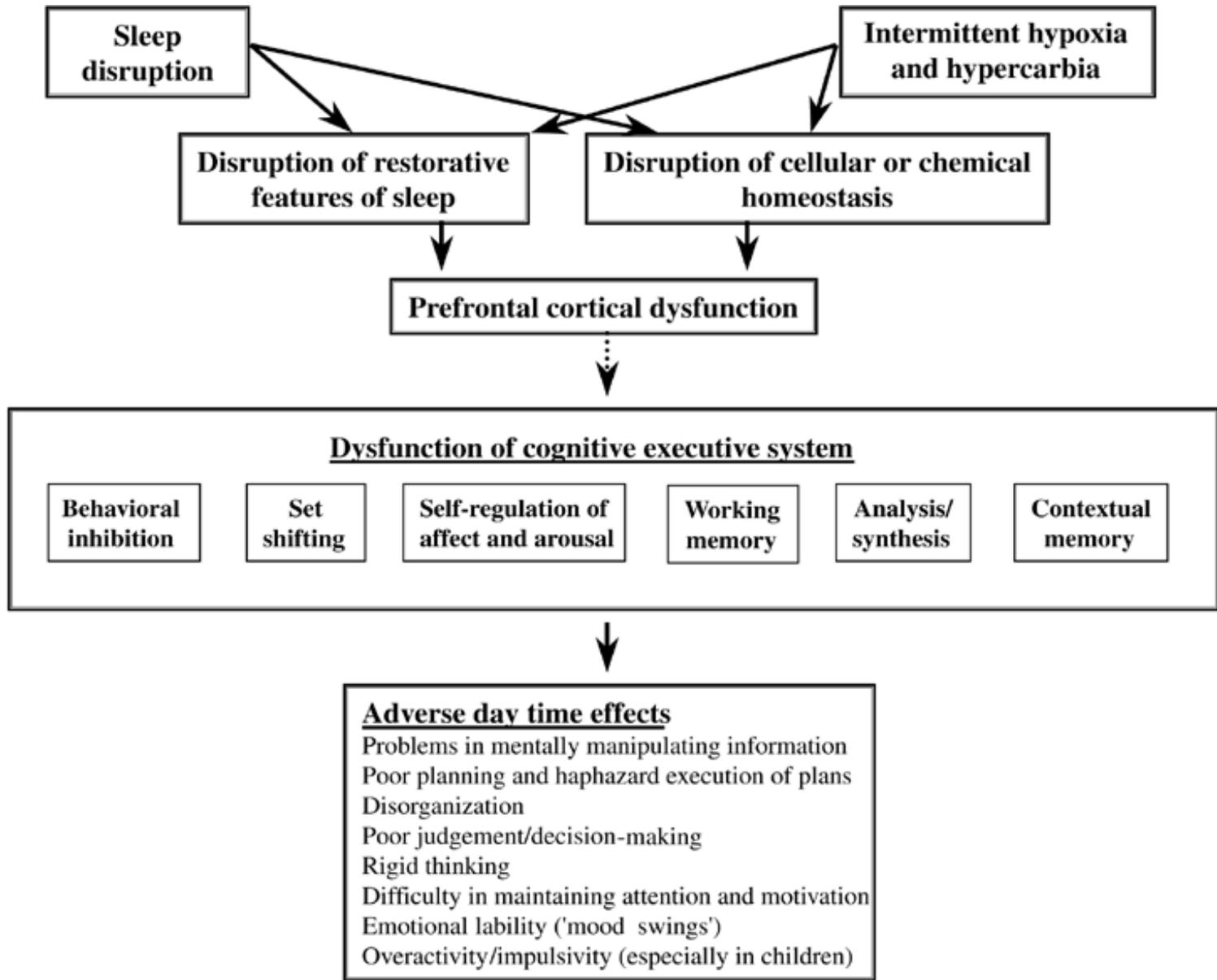


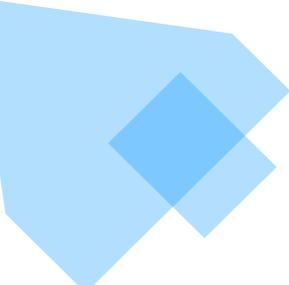
- Narrow and constricted airways are a primary cause of systemic inflammation, oxidative stress and endothelial dysfunction
- Major contributing and perpetuating factors to cardiovascular disease, diabetes, refractory depression and anxiety



# ORTHODONTICS

- Rapid Maxillary Expansion in children should be considered where there exists a constricted maxillary vault, mouth breathing, increased nasal resistance and alteration of tongue posture all leading to retroglossal airway narrowing.
- Studies in Sleep Dec,1998 by Cistulli and Pirelli in 2004,





NEWS



# Study Uncovers Association Between Sleep Apnea and Lower Brain Volume

Brionna Mendoza

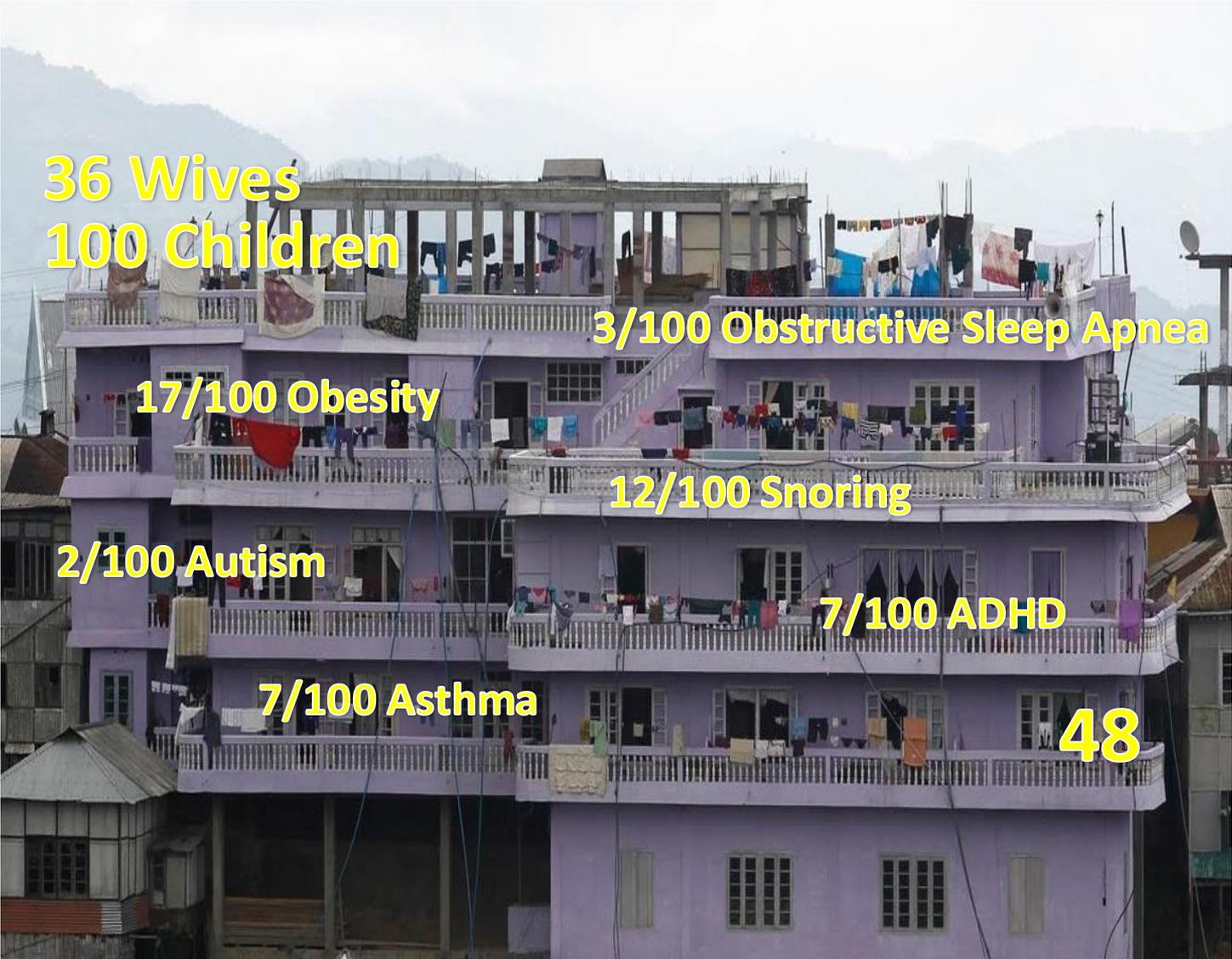
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06/19/2023



# Why Is This Child Asleep At Her Birthday Party?





**36 Wives**  
**100 Children**

**3/100 Obstructive Sleep Apnea**

**17/100 Obesity**

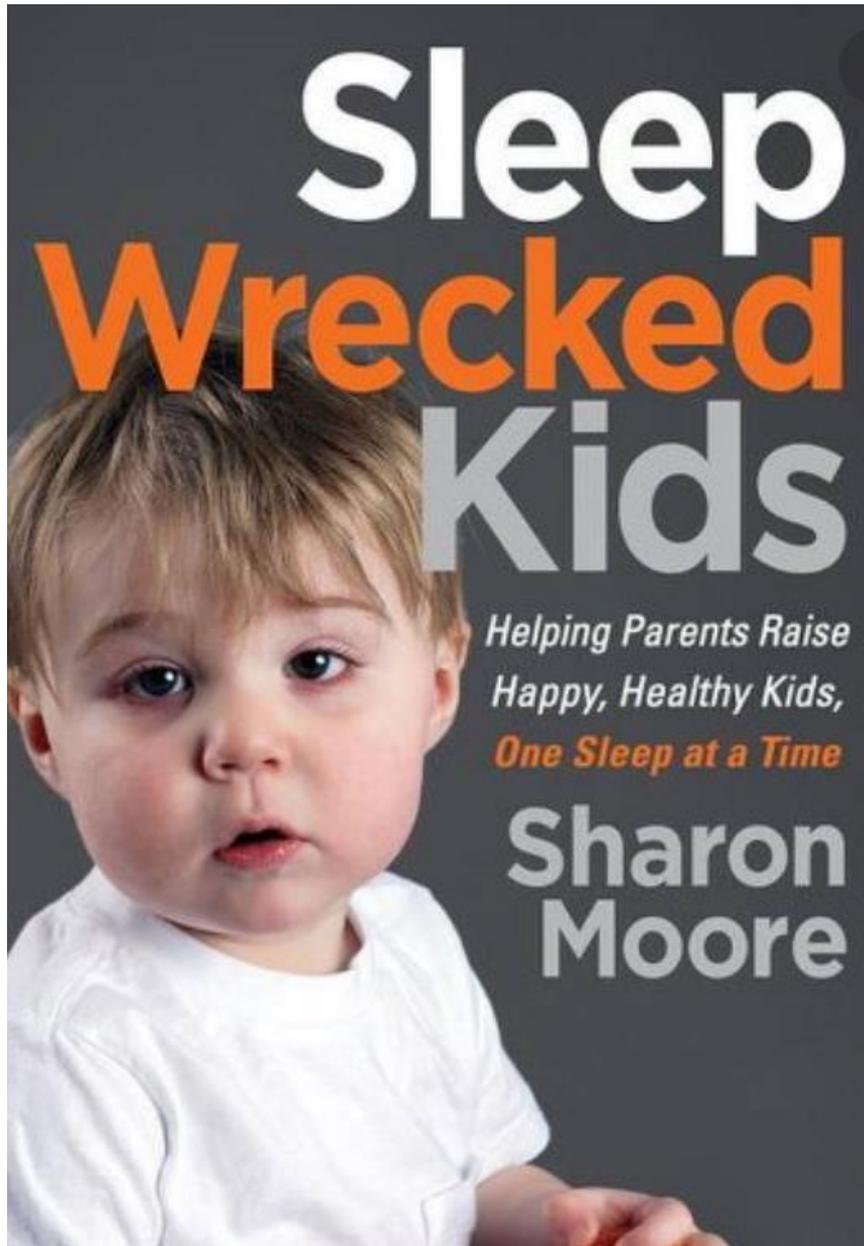
**12/100 Snoring**

**2/100 Autism**

**7/100 ADHD**

**7/100 Asthma**

**48**



# Sleep Wrecked Kids

*Helping Parents Raise  
Happy, Healthy Kids,  
One Sleep at a Time*

**Sharon  
Moore**

# Impact of sleep disordered breathing on behavior among elementary school-aged children

- Large community based sample results;
  - Children who snore may be at risk for developing attention and behavioral regulatory concerns independent of the severity of SDB
  - If initial evaluation indicates behavioral control and learning concerns, consider a sleep study to possibly deter stimulant use
- 
- Pediatric Pulmonology and Sleep , Sept 01/2016
  - Dale Smith, David Gozal Scott Hunter et al.

## Attention-deficit/hyperactivity disorder with obstructive sleep apnea

- A AHI score( apnea/hypopnea index) of greater than 1 is considered abnormal and detrimental to children with ADHD
- Recognition and surgical treatment of underlying mild sleep disordered breathing in children with ADHD may prevent unnecessary long-term MPH usage and their potential side effects
- Sleep Medicine 8 (2007) 18-30. Yu-Shu Huang, Christian Guilleminault

# Childrens Health

- What is the effect of disturbed sleep patterns on our children's mental and physical development?
- Grow out of it?
- Explore the distressing increase in ADHD, Autism and Obesity in the worlds population



# Signs of ADHD

- Constant motion/  
hyperactivity
- Difficult to focus on a task
- Easily distracted
- Unable to finish what  
they start
- Trouble listening
- Fidget/ talk excessively
- Act impulsively, intrude  
easily on others



# Evidence Based Association of Pediatric OSA

- Poor school performance
- Enuresis
- Failure to thrive
- Learning disabilities
- Obesity
- ADD/ Hyperactivity
- AHI for Children – Adolescents
  - 1-4 mild 5-10 moderate >10 severe



# Screening for Sleep Disorders Children and Adolescents

- BEARS Evaluation
- PSQ Pediatric Sleep Questionnaire
- Diagnosis and Management of Childhood OSA  
American Academy of Pediatrics 2002  
Updated 2012

# BEARS Sleep Screening Tool



	TODDLER/PRESCHOOL (2-5 YEARS)	SCHOOL-AGED (6-12 YEARS)	ADOLESCENT (13-18 YEARS)
<b>B</b> EDTIME PROBLEMS	Does your child have any problems going to bed? Falling asleep?	Does your child have any problems at bedtime? (P) Do you have any problems going to bed? (C)	Do you have any problems falling asleep at bedtime? (C)
<b>E</b> XCESSIVE DAYTIME SLEEPINESS	Does your child seem overtired or sleepy a lot during the day? Does he/she still take naps?	Does your child have difficulty waking in the morning, seem sleepy during the day or take naps? (P) Do you feel tired a lot? (C)	Do you feel sleepy a lot during the day? In school? While driving? (C)
<b>A</b> WAKENINGS DURING THE NIGHT	Does your child wake up a lot at night?	Does your child seem to wake up a lot at night? Any sleepwalking or nightmares? (P) Do you wake up a lot at night? Have trouble getting back to sleep? (C)	Do you wake up a lot at night? Have trouble getting back to sleep? (C)
<b>R</b> EGULARITY AND DURATION OF SLEEP	Does your child have a regular bedtime and wake time? What are they?	What time does your child go to bed and get up on school days? Weekends? Do you think he/she is getting enough sleep? (P)	What time do you usually go to bed on school nights? Weekends? How much sleep do you usually get? (C)
<b>S</b> NORING	Does your child snore a lot or have difficult breathing at night?	Does your child have loud or nightly snoring or any breathing difficulties at night? (P)	Does your teenager snore loudly or nightly? (P)

(P) Parent-directed question (C) Child-directed question

Reproduced with permission from: "A Clinical Guide to Pediatric Sleep: Diagnosis and Management of Sleep Problems" by Jodi A. Mindell and Judith A. Owens; 2003: Lippincott Williams & Wilkins.

# Lullaby™

## PEDIATRIC SENSORS

The most advanced and innovative family of diagnostic sleep sensors made especially for pediatric patients.

by **DyMedix**<sup>®</sup>  
DIAGNOSTICS



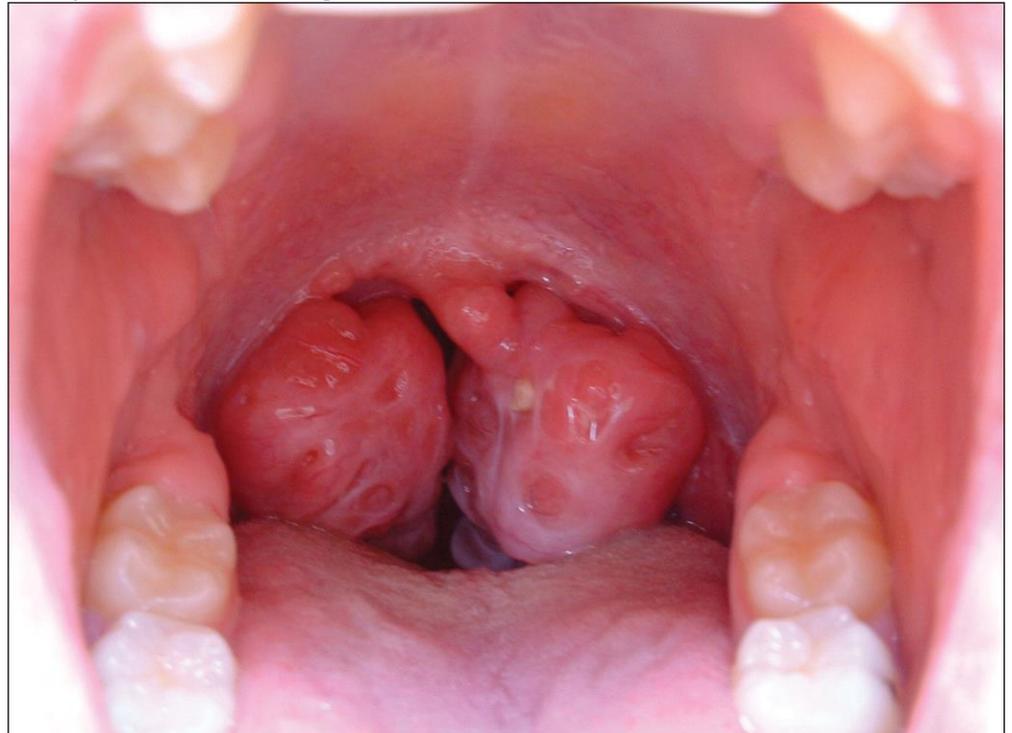
# Restricted Lingual Frenum



# Clinical Findings

- Primary; Adenotonsillar Hypertrophy
  - T/A 500 thousand /yearly
  - 50-80% improvement with disturbed sleep score
  - 1-2% irreducible rate of post-op hemorrhage

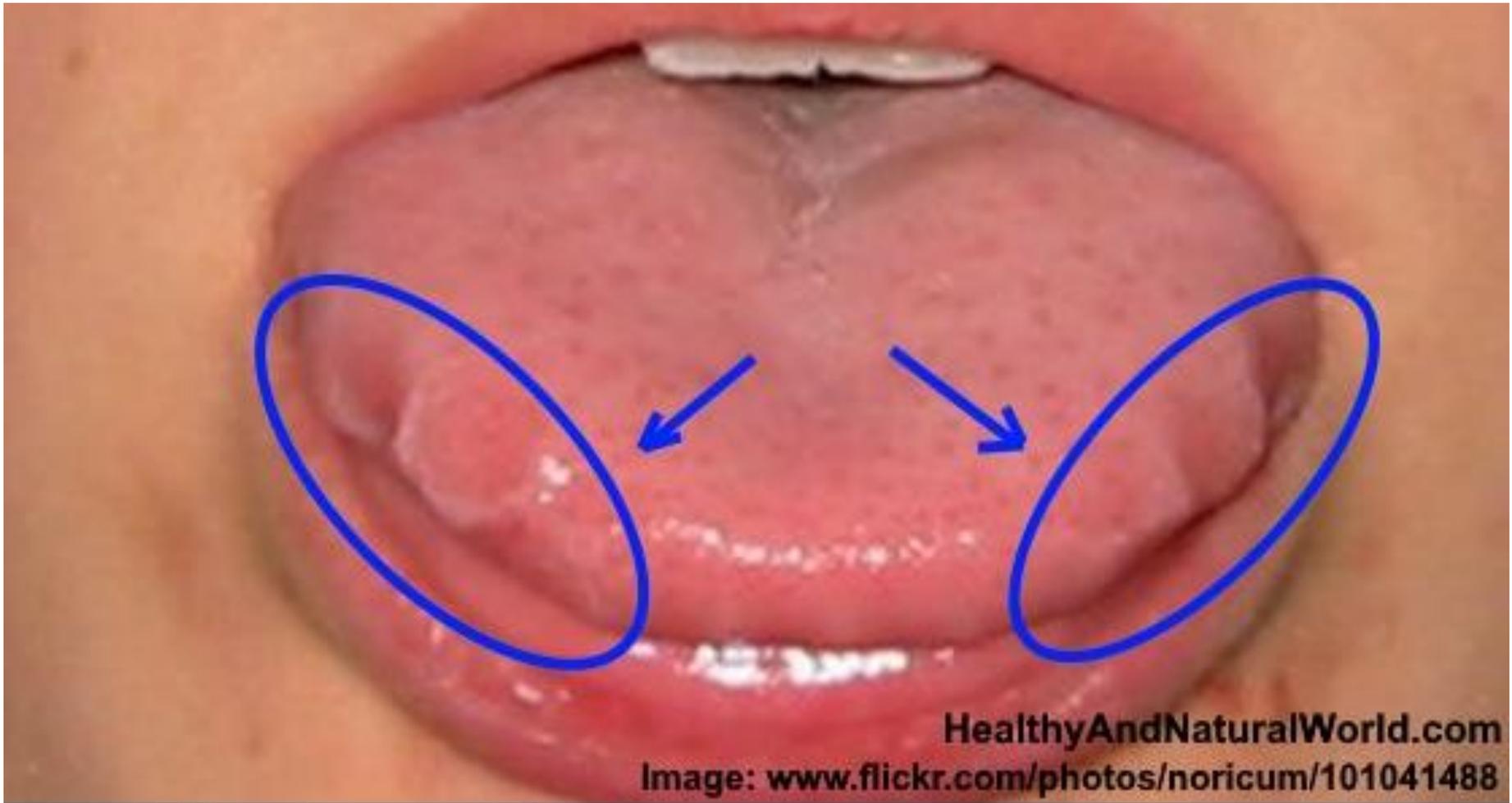
- Secondary;
  - mouth breather
  - nasal airway obstruction
  - allergic shiners
  - allergies
  - GERD
  - Tooth wear
  - high vaulted palate
  - adenoidal face shape



# Mallampati Index



# Scalloped Tongue



HealthyAndNaturalWorld.com

Image: [www.flickr.com/photos/noricum/101041488](http://www.flickr.com/photos/noricum/101041488)

# Scalloped Tongue Etiology

- Downs Syndrome
- Hypothyroid
- Apert Syndrome
- Amyloidosis
- Sleep apnea
- Parafunctional Activity

## **Scalloped Tongue:** What You Need to Know



## Scalloped Tongue

- Bruxism and airway are related to the patients attempt to open the airway during periods of decreasing oxygen. RMMA
- Return of breathing activates the jaw opening muscles, forcing the tongue forward against the teeth in an attempt to clear the oropharyngeal space, routinely, resulting in the traditional scalloped tongue design

# Adenoidal Face Shape

- Photo with allergic shiner



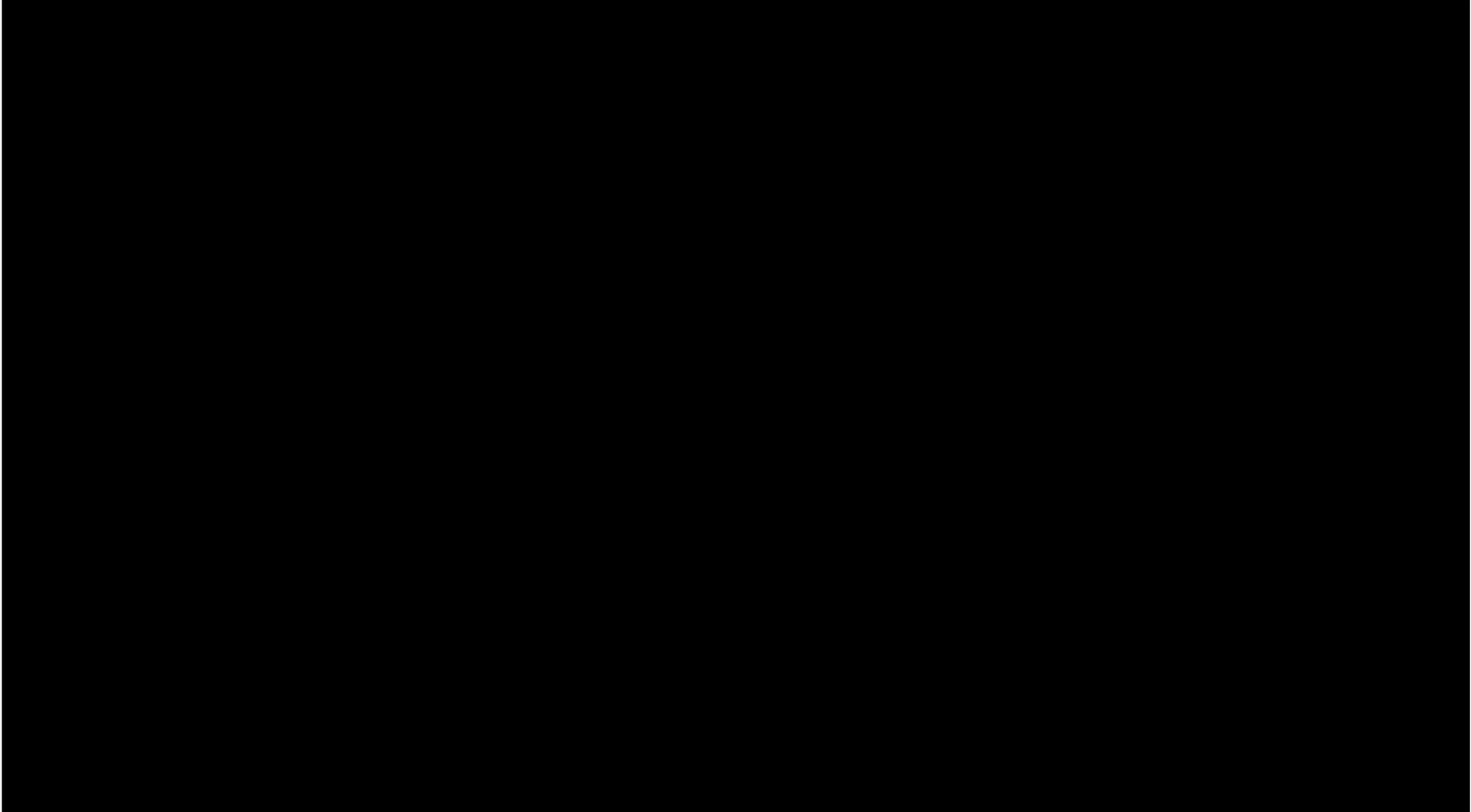
# PREMIES

C. Guilleminault , Stanford University

Many premature babies are mouth breathers due to a poorly structured functioning airway resulting in snoring and apnea which can lead to a disturbed prefrontal cortex which controls executive function skills, attentiveness, anxiety and depression. (ADHD)

Don't get time to practice suckling skills

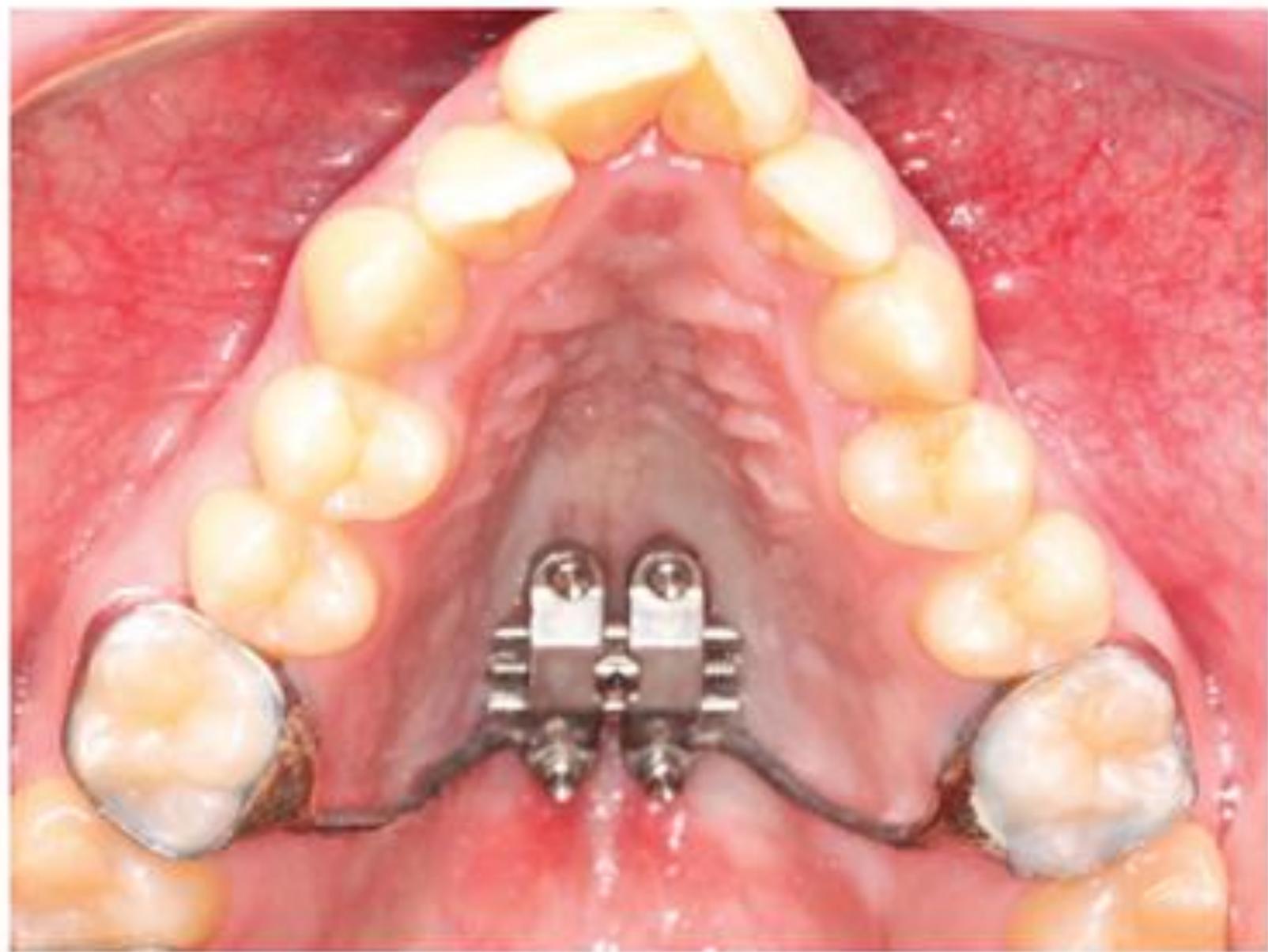




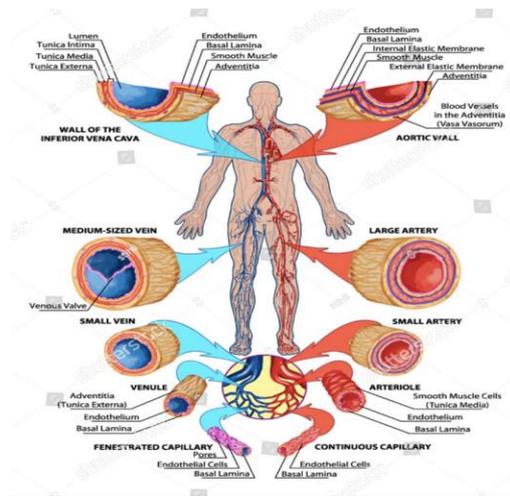
# ORTHODONTICS

- Rapid Maxillary Expansion in children should be considered where there exists a constricted maxillary vault, mouth breathing, increased nasal resistance and alteration of tongue posture all leading to retroglossal airway narrowing.
- Studies in Sleep Dec, 1998 by Cistulli and  
Pirelli in 2004,



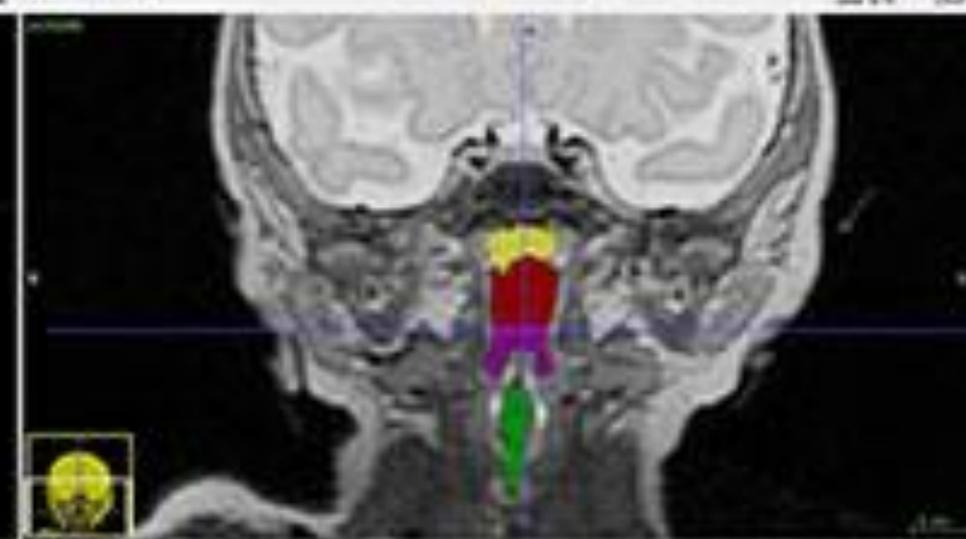
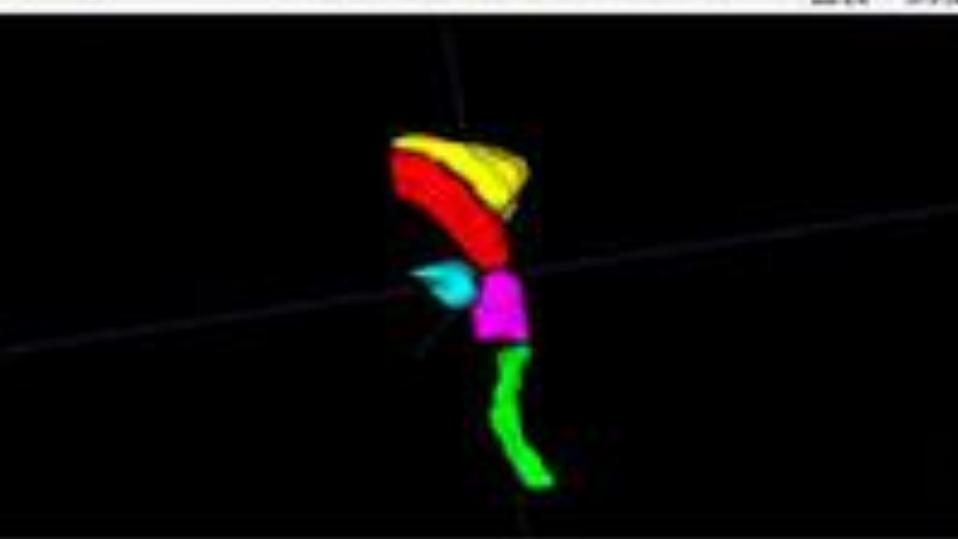
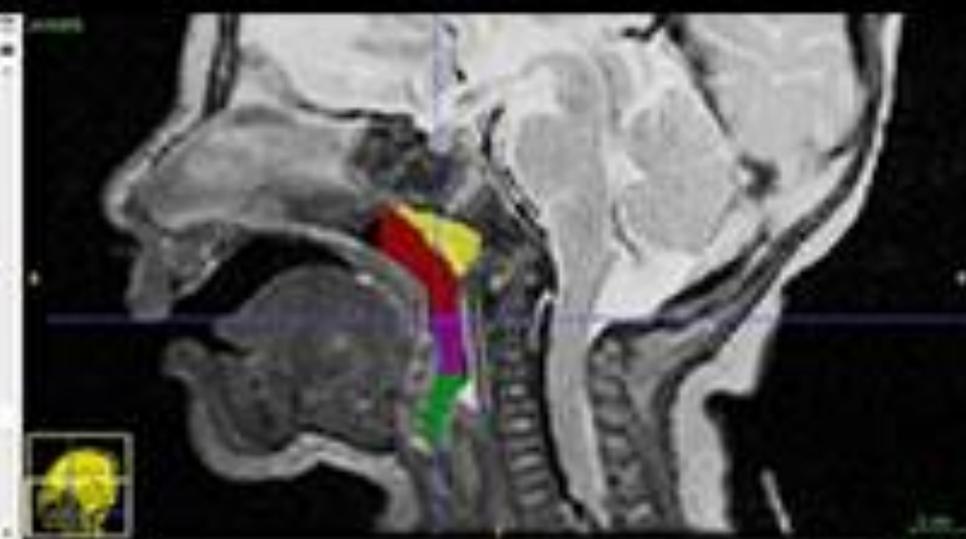
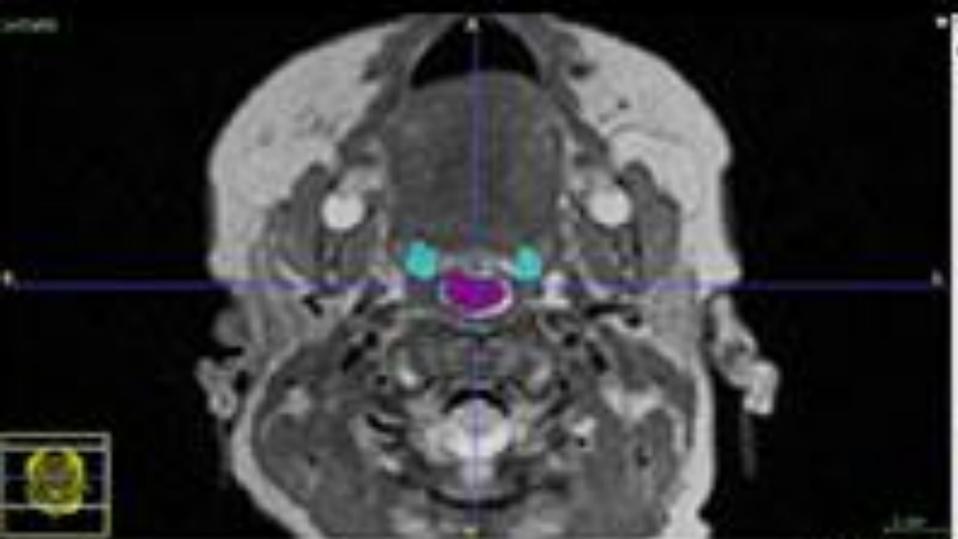


- Narrow and constricted airways are a primary cause of systemic inflammation, oxidative stress and endothelial dysfunction
- Major contributing and perpetuating factors to cardiovascular disease, diabetes, refractory depression and anxiety



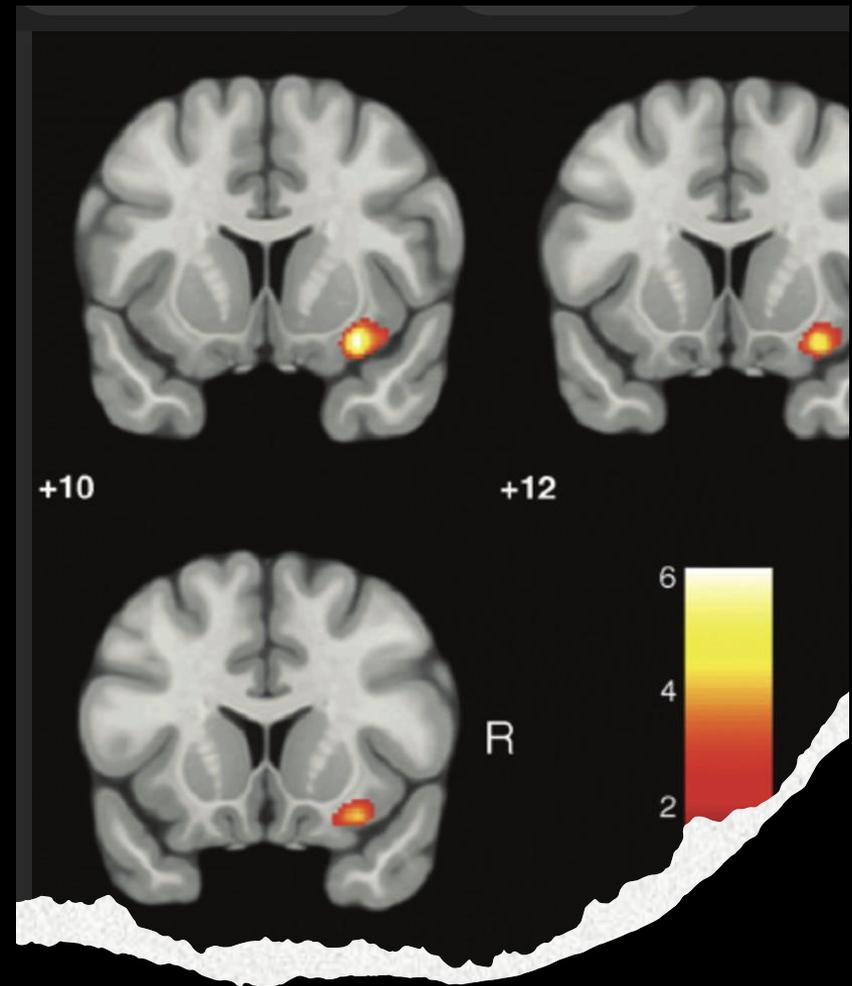
- Results;
- Pediatric OSA patients show extensive regionally demarcated grey matter volume reductions in areas that control cognition and mood functions even if such losses are apparently independent of cognitive deficits
- What's the concern? /higher grey matter volume has been associated with higher I.Q.
- Grey matter controls action, white matter controls communication
- Separate ADHD and disturbed sleep children ?





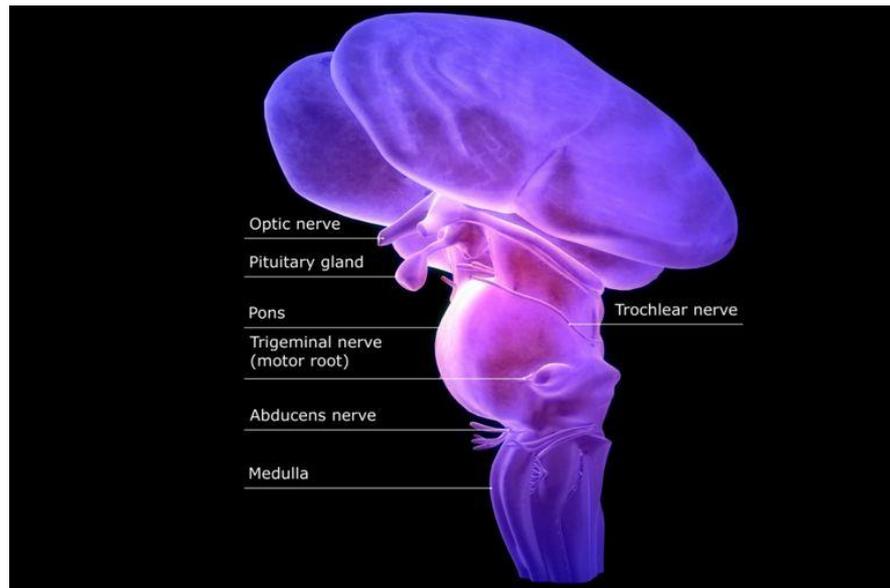
# Reduced Regional Grey Matter Volumes in Pediatric Obstructive Sleep Apnea

- Adult /MRI evidence of brain injury along with animal models indicating neuronal losses related to OSA.
- Study of PSG diagnosed 7-11 year olds
- Can pediatric OSA patients be affected?
- 16 children with OSA assessed for neuronal injury and decreased grey matter volume
- Significant volume loss was noted throughout the superior frontal and prefrontal , superior and lateral parietal cortices along with the brainstem and superior temporal lobe



# Autism

- In a study conducted by Jou, R; Frazier T.W. et al, Behavior ,Brain, Resident,2013.
- A two year longitudinal pilot MRI (no ionizing radiation) study of the brainstem in Autism .
- Decreased brain stem volume has been associated with Autism
- Volume change also seen with disturbed breathing patterns



# Etiology of ADHD

- To date the Causes of ADHD in children is unknown, some research suggests a genetic component, brain injury incurred during birth due to decrease in oxygen, consumption of alcohol during pregnancy and perhaps food additives.



# EPIGENETICS

- Epigenetics; anything other than DNA sequence that influence the development of an organism; chemical compounds, a change in phenotype without a change in genotype
- Dr. Gelb states “think of the incredible public health benefits derived by investing in our children before age five in the areas of brain development and prevention of epigenetic changes”



# Overview of ADHD

- The cause of ADHD in children is not definitively known but some possibilities are that's its genetic, resulting from brain injury due to decreased oxygen levels and sleep disturbed breathing.
- Present treatment involves psycho stimulants to help with focus and organization (Ritalin and Adderall)
- Special classes/ home schooling



# Methylphenidate

- MPH (Ritalin) is an amphetamine but milder
- CNS stimulant that has a calming effect on kids with ADHD by increasing their attention span by increasing certain natural substances in the brain
- Side effects may include ; decreased appetite, abdominal pain, decreased weight and increased sleep problems



## Negative Information

- If you suspect you or your child may have disordered breathing or ADHD symptoms don't accept;
- Pain problems don't go away
- You don't need a frenulum release
- ADHD is a disease, it won't go away
- Orthodontics /dental appliances won't help
- We'll just watch the tonsils/adenoids
- Jaw is too narrow, extract several permanent teeth



# Education

## Adina Minnesota Study

Responding to studies suggesting teens do not do well early in the morning inspired the school district to change school start times from 7:30 to 8:30.

Results; grades went up, truancy decreased, as well as behavior problems. SAT scores went up several hundred points on average

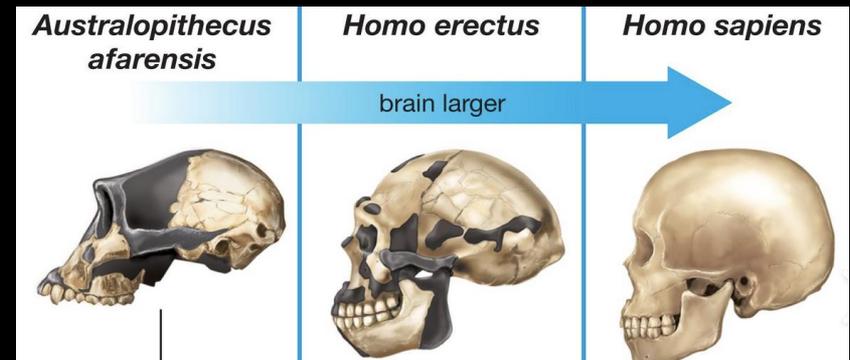
Teen auto accidents decreased 70%

When sleep is abundant, minds flourish



# BRAINS

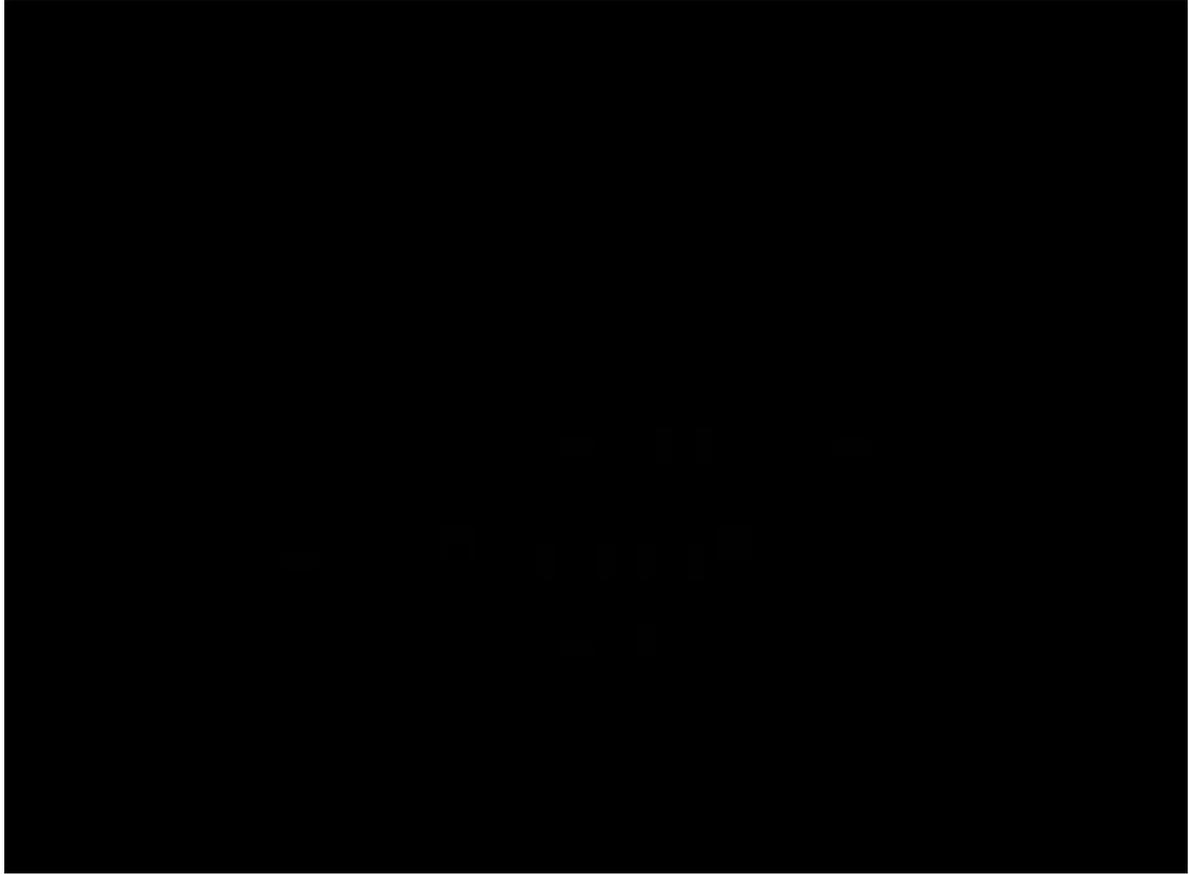
- Between 1980 -2007 ADHD increased 700% in the US.
- 8% of which are on medications
- Evolution as Homo Sapiens blessed us with an increased brain size but also small retracted faces and sinus, jaws have narrowed, allergies increased, we developed a flexible pharynx and collapsible airway





## Panthera D-SAD- /Myo Pediatric Oral Appliance

- Patient. Tailored mandibular appliance
- Rolling ball mechanism which promotes forward tongue movement which stimulates the genioglossus muscle, increasing tone and preventing it's posterior displacement
- Changes the shape of the child's oral cavity avoiding possible future OSA tx in the future
- GROWTH?

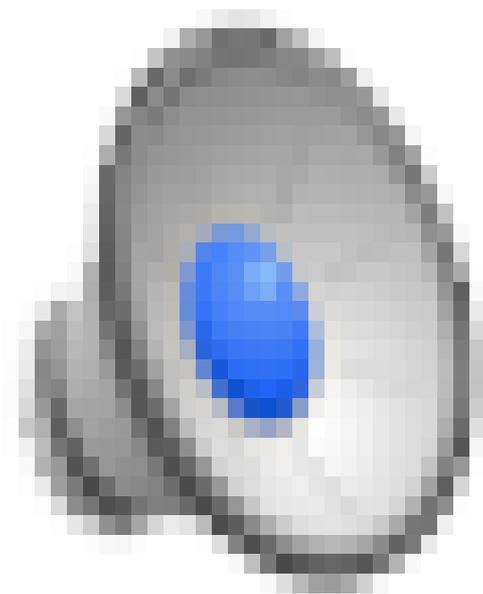




- Most kids with OSA appear to compensate to an extent for neural deficits
- Many published intervention studies show effective OSA treatment can produce significant improvements to restore cognitive functions

- What was missed, undiagnosed?
- Psychological exam
- Allergy testing
- Sleep Study
- Who put it all together?



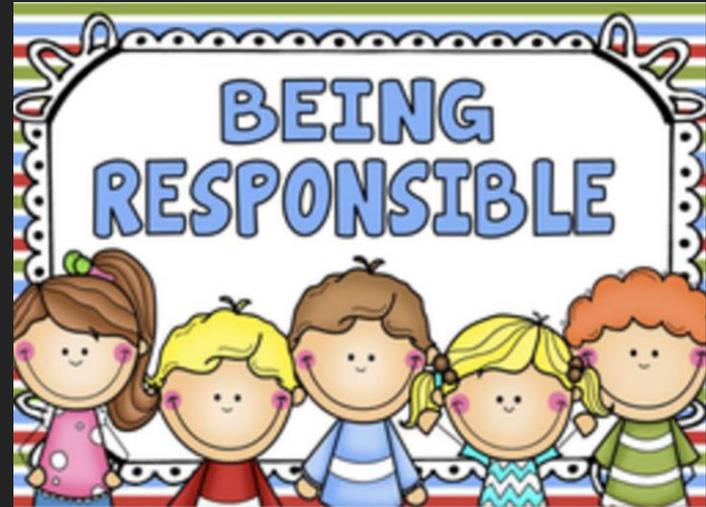


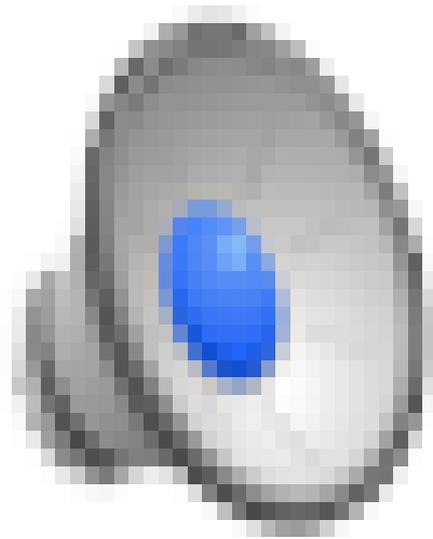
# THE DENTIST



# ADA/DentisResponsibility

- Awareness of the clinical findings discussed
- Add a basic sleep survey to your exam
- Refer if necessary to a sleep MD or DDS
- Advance your training if you wish to treat these patients





# Lets Review

Sleep has been a mystery throughout the ages

Disturbed sleep contributes to numerous co-morbidities

Children who suffer with ADHD may have a chance to rebound

ADA resolution 17a 2017 advises all dental practices to become aware of the need to add a sleep survey to your office examination



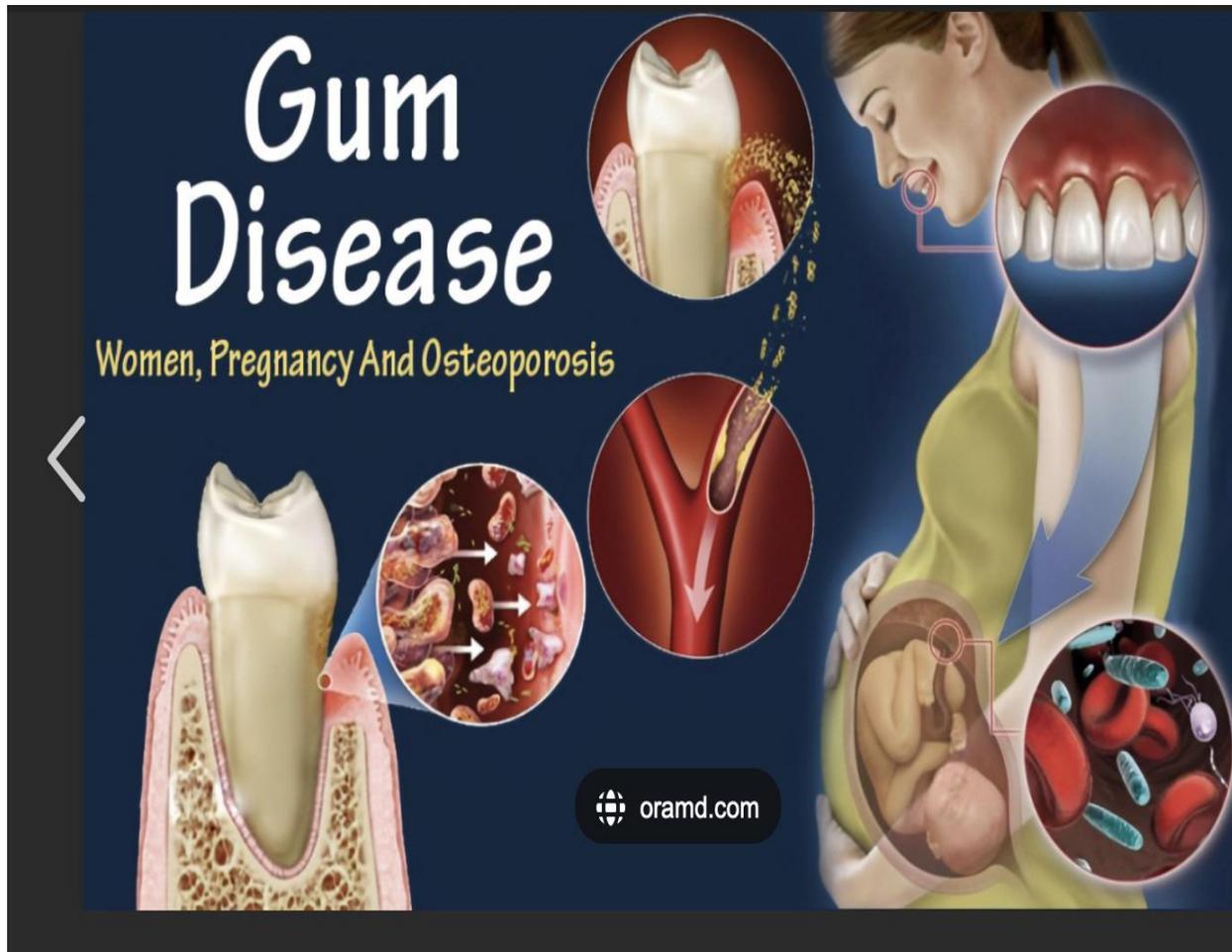
- Finally, several studies in adults have reported improvements in MRI findings following treatment with C-PAP ventilation via a mask
  - Fatouleh R. H, NeuroImage clinical 7 799-806 (2015)
  - Canessa N. Et al am j.RespCrit Care Med 183,1419-1426 (2011)





“Prevention is more preferable than treatment.”

# What a Periodontist Should Know



- Periodontitis and Obstructive Sleep Apnea share a common cascade of inflammatory responses and seem to share them synergistically

# What a Periodontist Should Know

- Periodontitis and Obstructive Sleep Apnea share a common cascade of inflammatory responses and seem to share them synergistically



[www.perioprotect.com/Canada](http://www.perioprotect.com/Canada)

Tanya Dunlap. 314 3782075



# Periodontitis and Alzheimer's Disease: Is There a Connection?

[William Lundergan](#), [Kavitha Parthasarathy](#), [Navid Knight](#) • Published in [Oral](#) 22 January 2024 • Medicine, Environmental Science

**TLDR** The biologic plausibility, evidence from human studies, evidence from animal studies, and therapeutic interventions are addressed as the current understanding of the link between periodontitis and Alzheimer's disease is reviewed. [Expand](#)



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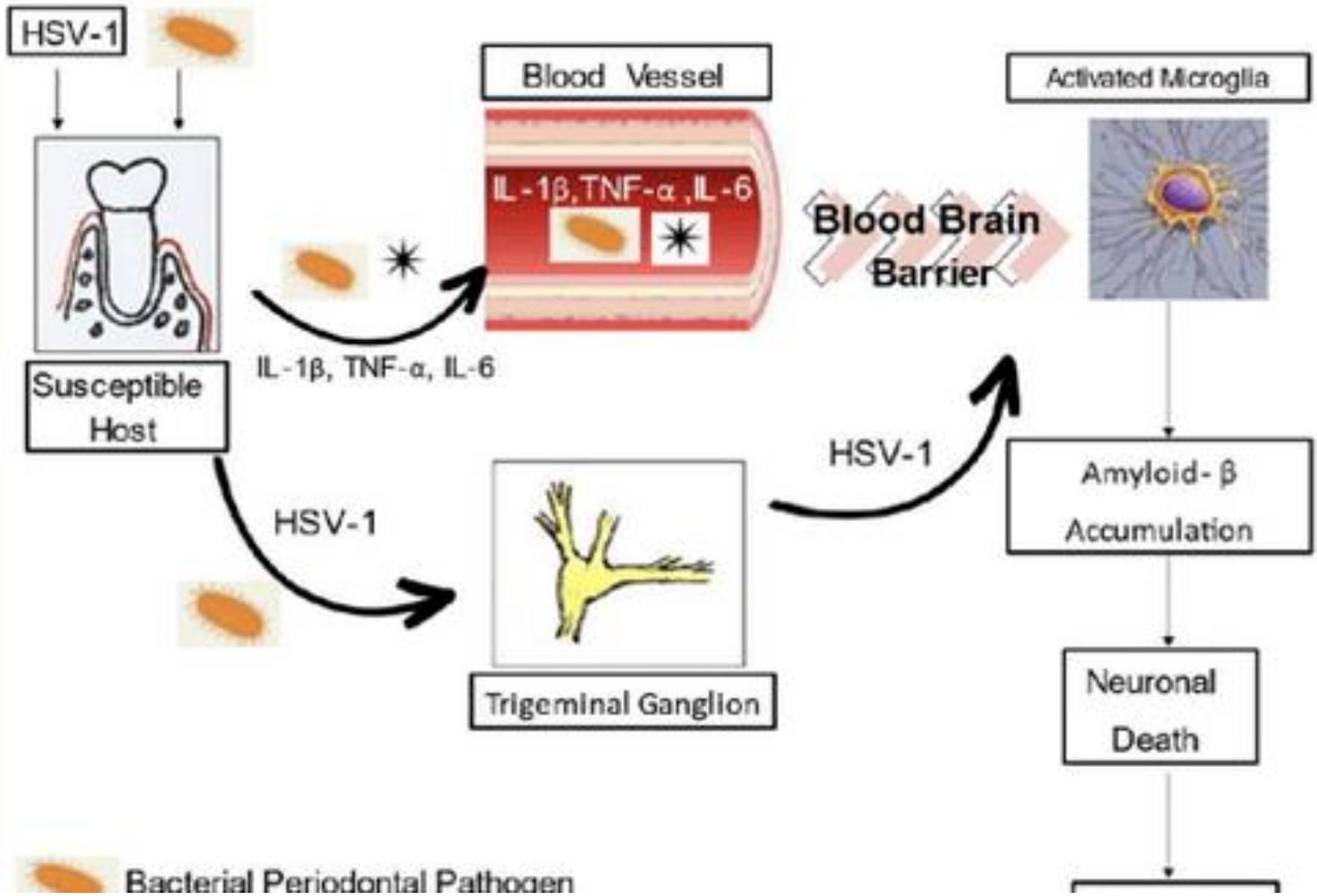
# Periodontitis and Alzheimer's Disease: Is There a Connection?

William Lundergan \*, Kavitha Parthasarathy and Navid Knight

Department of Periodontics, Arthur A. Dugoni School of Dentistry, University of the Pacific,  
San Francisco, CA 94103, USA

\* Correspondence: [wlundergan@pacific.edu](mailto:wlundergan@pacific.edu)

**Abstract:** The oral health/systemic health connection has been an area of research interest that increased dramatically during the 1990s. Periodontal disease has been associated with a number of systemic conditions, including cardiovascular disease, diabetes, pre-term low-birth-weight infants, respiratory conditions, rheumatoid arthritis, cancer, and Alzheimer's disease. Inflammation is the obvious link that connects periodontal disease with these conditions, but is this association casual or causal? We will address the biologic plausibility, evidence from human studies, evidence from animal studies, and therapeutic interventions as we review the current understanding of the link between periodontitis and Alzheimer's disease.



Research | [Open access](#) | Published: 30 October 2024

# Mediating role of systemic inflammation in the association between volatile organic compounds exposure and periodontitis: NHANES 2011–2014

[Zhida Dai](#), [Zhixiang Zhang](#), [Qiaobin Hu](#), [Xinyuan Yu](#), [Yixi Cao](#), [Yian Xia](#), [Yingyin Fu](#), [Yuxuan Tan](#), [Chunxia Jing](#)  & [Chunlei Zhang](#) 

[BMC Oral Health](#) **24**, Article number: 1324 (2024)

**383** Accesses | [Metrics](#)

- Study aimed to investigate the potential mediating role of systemic inflammation factors in the complex association between volatile organic compounds exposure and periodontitis.
- VOC's are environmental pollutants originating from fuel burning, industrial emissions, consumer products containing fragrance and tobacco smoke.
- Concentrations of urinary metabolites were measured. N-1555. 45% with PD
- Significant association between VOC exposure and periodontal disease.

# Periodontal Disease and Obstructive Sleep Apnea

- Numerous studies are reporting the association of periodontal disease and sleep disturbances by the assay of salivary cytokines
- Is there a relationship between interleukin and pentraxin serum levels in patients with periodontal disease and sleep disturbances?
- This study concluded a prevalence of periodontal disease in patients with OSA
- These two chronic conditions may be linked via common inflammatory pathways

# Association Between Periodontitis and OSA. Preliminary Study

- N-687 patients were studied for an association of onset and progressive periodontal disease and OSA
- Each patient had full periodontal exam and a PSG
- Results:
  - 17% had periodontal disease
  - 46% had OSA
  - 60% exhibited both.
  - Ratio 1.84 , 95% Confidence Level
- Further research needed for bidirectional causal relationship

## **Periodontal Disease Tied To Increased Risk Of Eventual RA Diagnosis, Study Finds**

[MedPage Today](#)   (5/2, Gever) reports, "Although the mechanistic relationship is still unclear, that periodontal disease is connected with rheumatoid arthritis (RA) is no longer in question." According to a new [study](#)   published in Annals of the Rheumatic Diseases, patients "having previous tooth extractions and positive tests for anti-citrullinated protein antibodies (ACPA) were more than twice as likely to be diagnosed eventually with RA or other forms of inflammatory arthritis (adjusted HR 2.22, 95% CI 1.23-4.00), according to" researchers. This "association was even stronger after further adjustment for subclinical joint inflammation (HR 3.10, 95% CI 1.57-6.10), the group reported."

Systematic Review

# Periodontal diseases and cardiovascular diseases, diabetes, and respiratory diseases: Summary of the consensus report by the European Federation of Periodontology and WONCA Europe

David Herrera  , Mariano Sanz , Lior Shapira , Carlos Brotons , Iain Chapple , Thomas Frese , ...show all

Article: 2320120 | Received 18 Oct 2023, Accepted 05 Feb 2024, Published online: 21 Mar 2024

 Cite this article

 <https://doi.org/10.1080/13814788.2024.2320120>



[Full Article](#)[Figures & data](#)[References](#)[Citations](#)[Metrics](#)[Licensing](#)[Reprints & Permissions](#)[View PDF](#)

## Abstract

### Background

Periodontitis is a chronic inflammatory non-communicable disease (NCD) characterised by the destruction of the tooth-supporting apparatus (periodontium), including alveolar bone, the presence of periodontal pockets, and bleeding on probing.

### Objectives

To outline, for family doctors, the implications of the association between periodontal and systemic diseases; to explore the role of family doctors in managing periodontitis as an ubiquitous non-communicable disease (NCD).





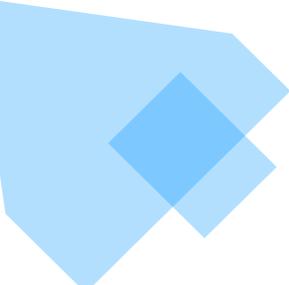
## **Results**

Periodontitis is independently associated with cardiovascular diseases, diabetes, chronic obstructive pulmonary disease, obstructive sleep apnoea, and COVID-19 complications. Treatment of periodontitis has been associated with improvements in systemic health outcomes. The article also presents evidence gaps. Oral health care professionals (OHPs) and family doctors should collaborate in managing these conditions, including implementing strategies for early case detection of periodontitis in primary medical care centres and of systemic NCDs in oral/dental care settings. There is a need to raise awareness of periodontal diseases, their consequences, and the associated risk factors amongst family doctors.

## **Conclusion**

Closer collaboration between OHPs and family doctors is important in the early case detection and management of NCDs like cardiovascular diseases, diabetes mellitus, and respiratory diseases. Strategies for early case detection/prevention of NCDs, including periodontitis, should be developed for family doctors, other health professionals (OHPs), and healthcare funders. Evidence-based information on the reported associations between periodontitis and other NCDs should be made available to family doctors, OHPs, healthcare funders, patients, and the general population.





# Oral-Periodontal and Systemic Relationships Part II: Reproductive Issues, Osteoporosis, Cognitive Impairment, and Cancer

Alison Glascoe, DDS, MS

June 2023 RN - Expires Tuesday, June 30th, 2026

*United Concordia*

## *Abstract*

*Because the mouth is a part of the body, its health may have a crucial impact on the rest of the body. Periodontal disease is common, chronic, and inflammatory, affecting the supporting structures of the teeth. Researchers have proposed periodontal disease to be a risk factor for many common, chronic, and systemic conditions such as reproductive issues, osteoporosis, cognitive impairment, and cancer.*





# Research & Innovation

## **Study: Sleeping At Least Seven Hours Each Night Reduces Caries Risk**

[DrBicuspid](#)   (7/20, Busch) reports a new study found that “people who slept at least seven hours per night were less likely to have dental cavities than those who slumbered for less than seven hours.” One additional “hour of sleep may dramatically reduce a person’s chance of having caries, according to a large study of the U.S. population.” The [findings](#)   were published in BMC Oral Health.



# Treatment

Detailed Diagnosis and Etiology

Observe and Wait????

Fluoride Treatments

Modify behaviors

Early prevention and intervention

Conservative restorative care

Occlusal appliances

Rehabilitation if needed

## Short term vs. long term solutions

Providing patients with options

CONDITIONS	SHORT TERM TREATMENTS	LONG TERM ORTHODONTIC SOLUTIONS
<b>Abfractions</b>	Class V composite / gingival graft occlusal adjustments	Uprighting teeth to correct the vertical alignment and take teeth out of trauma
<b>Anterior incisal fracturing</b>	Veneers/crowns/occlusal adjustments	Correcting the malocclusion; usually end to end, anterior crossbite, or deep bite
<b>Worn down / fractured posterior teeth</b>	Crowns / occlusal adjustments / Night Guards	Correcting the malocclusion by taking teeth out of trauma; provide canine guidance

# Minimally Invasive Care in Oral Health

## Dental and Medical Billing Codes



## Dental Codes (CDT)

**D2991** Application of hydroxyapatite regeneration medicament. **NEW in 2024,** [learn more.](#)

**D1354** [Silver diamine fluoride](#) (SDF) treatment.

**D1355** Alternative to sealants for site specific prevention.

**D1999** Unspecified preventive procedure.

**D4381** Localized delivery of antimicrobial agents.

## Medical Codes (CPT)

**X115T** Application of silver diamine fluoride (SDF) by a physician or other qualified health care professional. **NEW in 2023,** [learn more.](#)

**0792T** Silver diamine fluoride for dental caries.

**99188** Application of topical fluoride varnish by a physician or other qualified health care professional.

# What's up with Fluoride ?

US Public Health Service recommended adding fluoride to drinking water in 1962, currently recommended 0.7mg per liter of water.

Last year the National Toxicology Program concluded in a report that higher levels of fluoride exposure are associated with lower IQ in children.

National Institute of Craniolfacial Research noted that the NTP does not claim that the 0.7mg/l has any effect on IQ.

The NTP report was based on epidemiology studies in non US countries where some fluoride exposure amounts were reported at 1.5mg of fluoride /liter

Recently, Robert Kennedy Jr, claimed on a post on X, that fluoride is associated with arthritis, bone fractures, IQ loss etc but did not cite any evidence. He suggested Pres. Trump would consider the Fluoride situation.

# Fluoride Discussion

- Options:
- Sodium Fluoride
- Stannous Fluoride
- nHydroxyapatite
- Drinking Water Fluoridation
- Direct Fluoride applications





# Fluoride: Good or Evil?

## Benefit versus Risk

V. Kim Kutsch, DMD.



# Is Fluoride: Good or Evil?

There's two sides to the  
issue...and facts and emotion

# It's Complicated...



- Most CWF studies done prior to 1975
- Since then, major changes in F<sup>-</sup> availability
- Also, American diet and pharmaceutical use has changed significantly
- Topical benefit without the systemic risks?
- There's more to the equation....

Iheozor-Ejiofor Z, Worthington HV, Walsh T, O'Malley L, Clarkson JE, et al. Water fluoridation for the prevention of dental caries. Cochrane Database Syst Rev. 2015 Jun 18;6:CD010856. doi: 10.1002/14651858.CD010856.pub2. 155, 107.

“There is **very little contemporary evidence**, meeting the review's inclusion criteria, that has evaluated the effectiveness of water fluoridation for the prevention of caries. The available data come predominantly from studies conducted prior to 1975.”



# Nano-HA: Good or Evil?

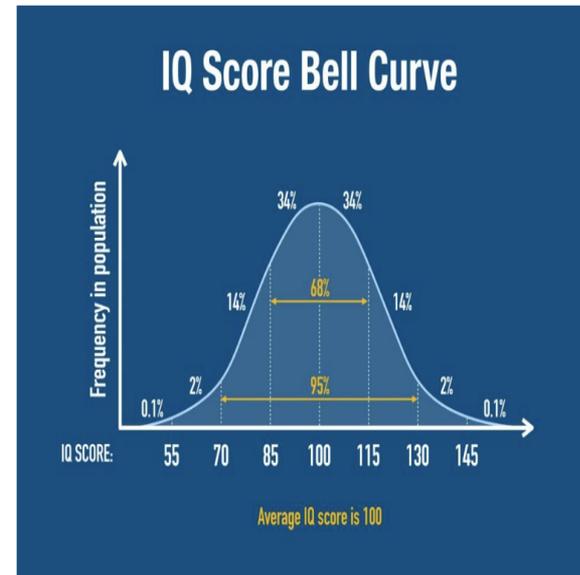
Benefit versus Risk

## Properties of nano-HA

- Critical pH is 5.5
- 20 nm particle size is most thermodynamically stable
- As pH drops it increases dissolution until it reverses and unexpectedly becomes more resistant to demineralization
- Supersaturated in the saliva, as crystallites not ions (pH)
- Fluoride adsorbs to it and attracts additional phosphate
- Penetrates the lesion and also forms a new apatite layer on the surface of enamel

Do LG, Sawyer A, John Spencer A, Leary S, Kuring JK, Jones AL, Le T, Reece CE, Ha DH. Early Childhood Exposures to Fluorides and Cognitive Neurodevelopment: A Population-Based Longitudinal Study. J Dent Res. 2025 Mar;104(3):243-250. doi: 10.1177/00220345241299352. Epub 2024 Dec 18. PMID: 39692252; PMCID: PMC11843800. 357 16-26 yo

“The hypothesis of noninferiority tests found that full-scale IQ (FSIQ) scores of those exposed and nonexposed to fluoride were equivalent. The study provided consistent evidence that early childhood exposure to fluoride does not have effects on cognitive neurodevelopment.”



# Fluidinova NanoXIM<sup>tm</sup>

“The nanoXIM·CarePaste manufactured by FLUIDINOVA is now the only nano-hydroxyapatite (nHAp) in the world scrutinized and approved as safe for oral care cosmetics by the Scientific Committee on Consumer Safety (SCCS) European authorities.”

\*Budenheim



Roveri N, Battistella E, Bianchi CL, et al. Surface enamel remineralization: biomimetic apatite nanocrystals and fluoride ions different effects. Journal of Nanomaterials 2009, article ID 746383, 9 pages.

# Top News

Advertisement



## Review Examines Fluoridation's Impact On Dental Health

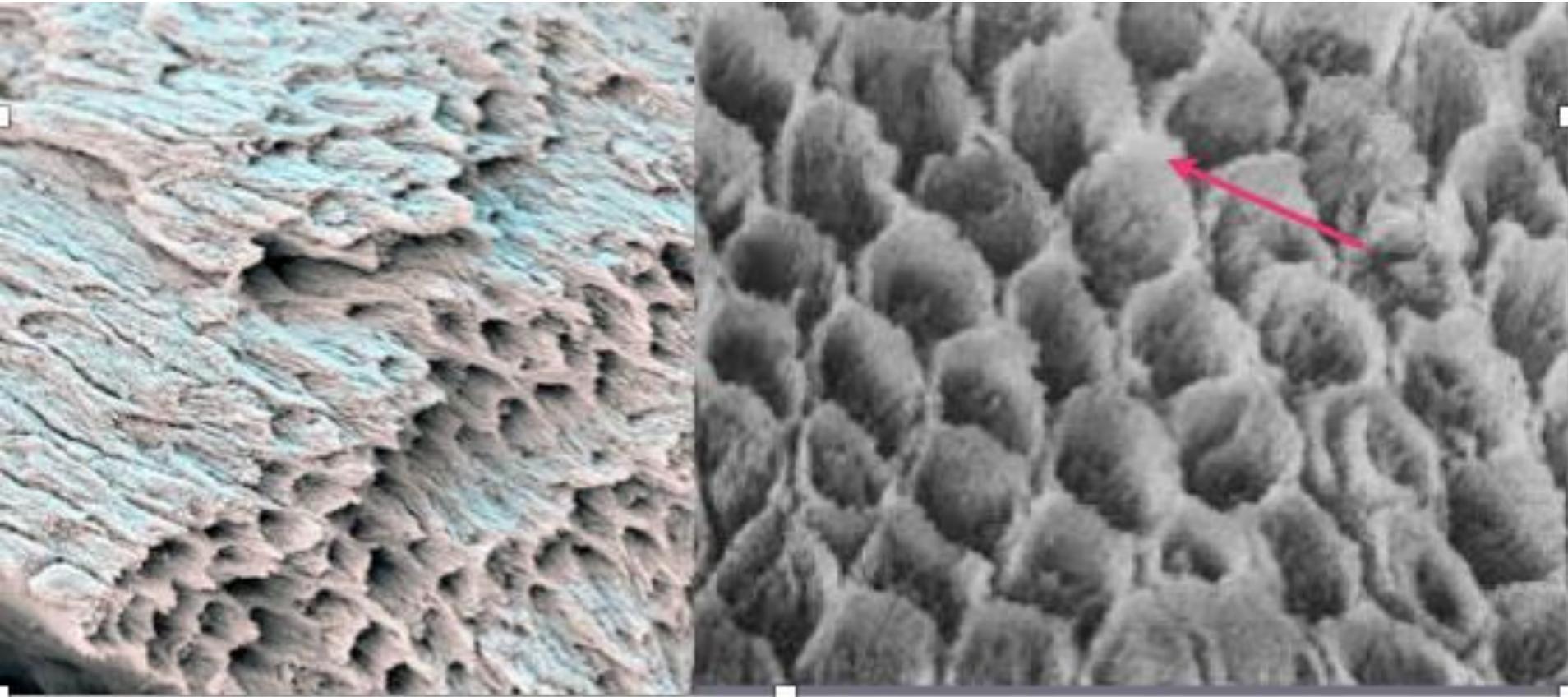
In a column for [Dimensions Of Dental Hygiene](#)  (3/24), contributor Michael P. Rethman, DDS, MS, writes that a systematic review by the Cochrane Collaboration found minimal benefit of water fluoridation for adults and a small benefit for children in preventing dental caries. Meanwhile, a review by JAMA Pediatrics linked fluoridated water to lower IQ scores in children, though the fluoride levels associated with these effects were higher than U.S. recommendations. Rethman also discusses the

historical context of water fluoridation and questions its current necessity, citing the shift in recommended fluoride levels from 1 ppm to 0.7 ppm. The overall public health impact of fluoridation remains debated, weighing potential benefits against risks.

TB ABRASION  
ABFRACTION  
ACID EROSION

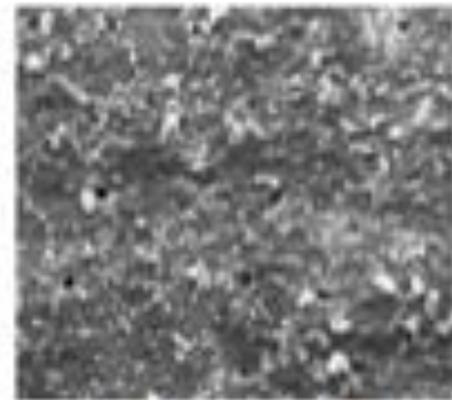
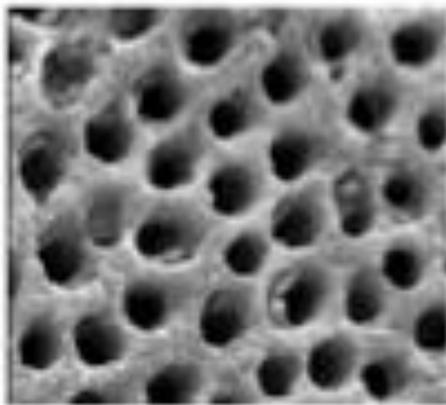
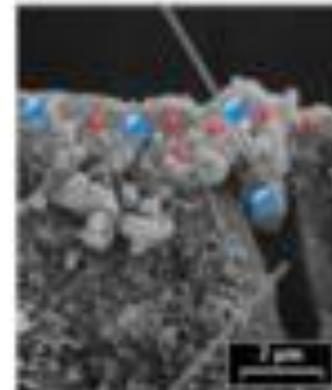
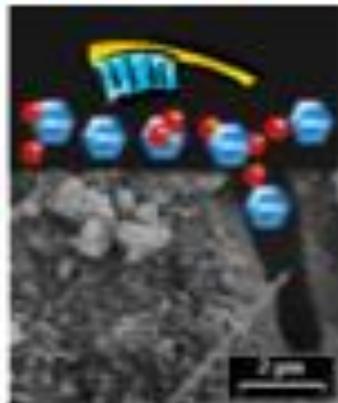


What about dentifrices?



- After acid attack, calcified material is removed
- Leaves a soft organic matrix
- This matrix is easily abraded away with brushing, bruxing etc.

# Mechanism of Action of Stannous Fluoride

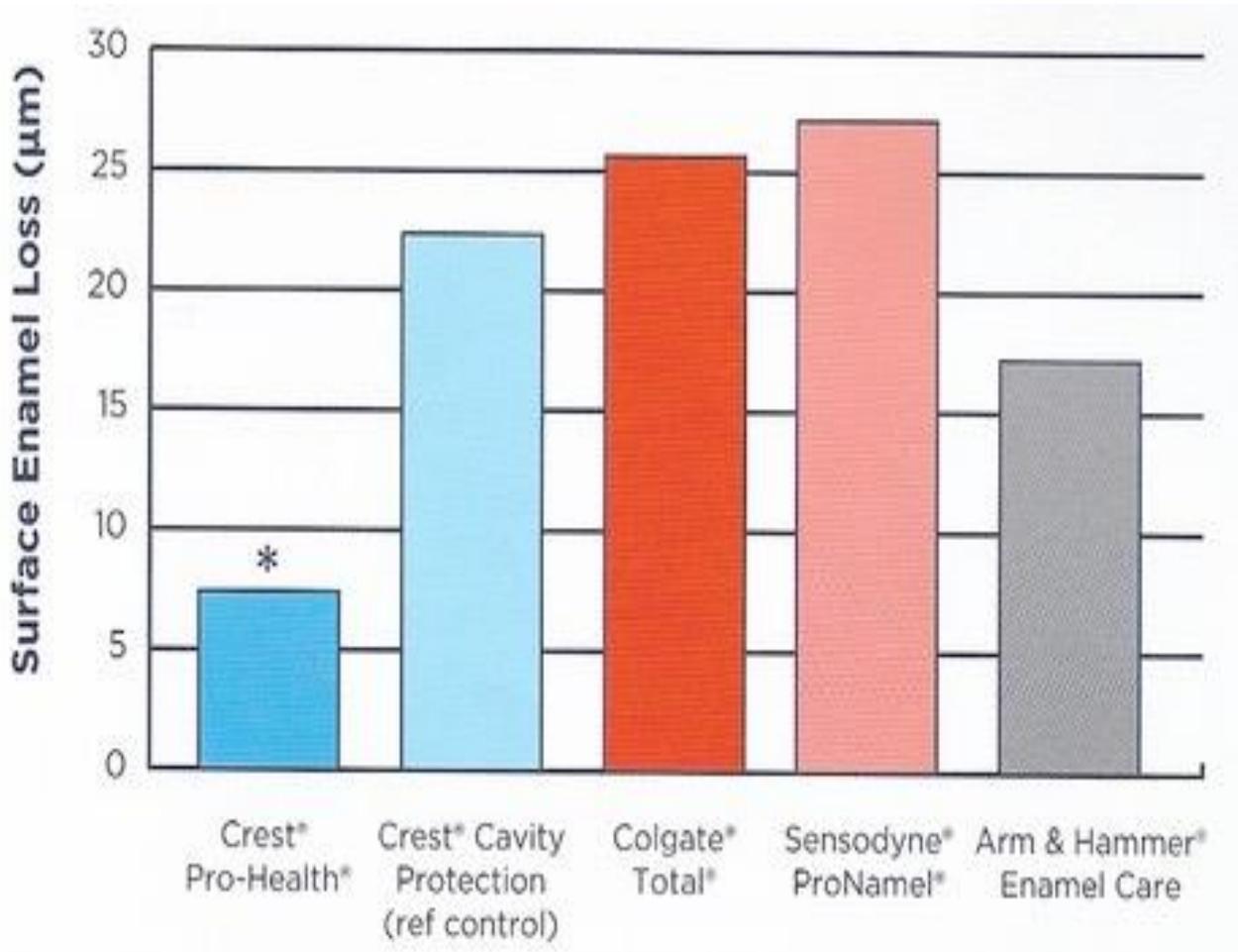


Open dentinal tubules

Blockage of open dentinal tubules after brushing with Crest Pro-Health

# Prevention

## Fluoride Treatment-toothpastes





# UP TO 4MM BELOW THE GUMLINE

To transform your patients' health

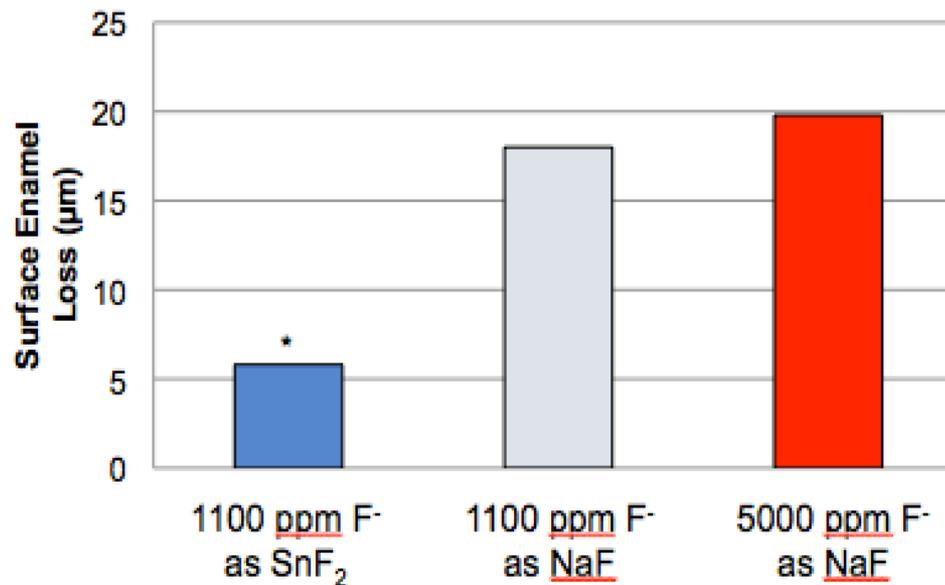
- **Penetrates** to the depth of the biofilm
- **Neutralizes gingivitis-causing toxins (LPS)**
- **Up to 4mm** subgingivally
- **Up to 12 hours** of gum protection

★ For clinically proven healthier gums

# Prevention

## Fluoride Treatment - Toothpastes

### Erosion Protection of High Fluoride Concentration



\*  $p < 0.05$  vs both NaF products.  
The high and low F NaF products were not different



- The enamel can remineralize
  - After an erosive attack tooth was 39% harder than control
  - CPP-ACP

MI Paste® ONE is a one-step toothpaste with RECALDENT™ technology that contains MI Paste Plus®. This product provides a simple solution for treating hypersensitivity, remineralizing tooth enamel, and preventing white spot lesions while simply brushing your teeth. Instead, of brushing and then applying a topical treatment, with MI Paste ONE you accomplish everything in a single step.

RECALDENT (CPP-ACP) is milk-derived protein that has a unique ability to release bio-available calcium, phosphate and fluoride to tooth surfaces, making a big difference in tooth health.

Indicated for:

- Hypersensitivity
- Remineralization
- Tooth erosion and wear
- Sensitivity from whitening
- Preventing caries & white spot lesions

Item includes: 10 x 40g Tubes



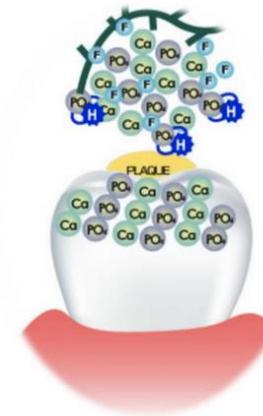
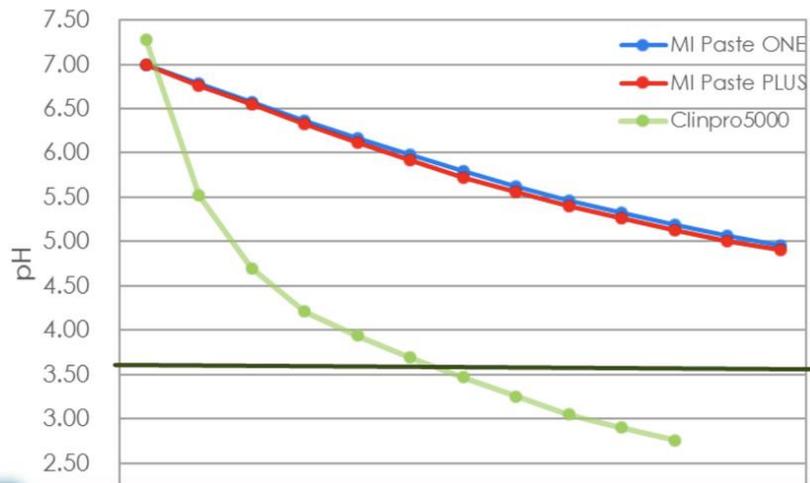
# FLUORIDE AND CPP-ACP

When fluoride ions come into contact with RECALDENT (CPP-ACP), the peptide combines with and stabilizes fluoride, to create the ideal source of ions for building fluorapatite. MI Paste Plus<sup>®</sup>, containing CPP-ACP and fluoride is the effective delivery vehicle for fluoride.



# BUFFERING CAPACITY

MI Paste ONE shows excellent acid buffering capacity than competitors, as good as MI Paste PLUS.



Dentifrices must have low REAs and RDAs  
(Relative Enamel/Dentin Abrasiveness)

With toothbrushes, brush stiffness and brushing  
force are less important—  
pH levels and abrasiveness of paste are most important.

Gum Detoxify  
Parodontax





# Saliva Buffer Test

- Test resting saliva, observe lower lip then blot and look for return of saliva. 60 sec or less is normal
- Is the saliva thick/frothy or watery which is good
- Ph measurement . Spit into the cup/ then place test strip for ten seconds and record with chart
- Have pt chew wax for 30 sec/ spit in cup /measure then chew 5 min.measure, 5ml is normal
- Test buffer. Add drops of saliva with dropper onto the three wells/ dry excess. Recheck pH chart for buffering effect.

# Profisil<sup>®</sup> Fluoride Varnish



## Finally, a Patient Pleasing, Smooth, Clean Fluoride Varnish

- Ethyl alcohol & Rosin Free for a pleasant patient experience
- Non-allergenic (no gluten, pine nuts, soy, dairy, shellfish)
- Tastes great with **no bitterness, burning or stinging.**
- Smooth easy application with **no clumping, stickiness, or grittiness**
- **Wet or dry application.** Can be applied in any direction. Migrates to difficult to reach areas.

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[www.kettenbachusa.com](http://www.kettenbachusa.com)



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Choose from Mint, Berry or Unflavored

#### **Buy:**

- 1 Normal Pack for **\$99.00** ea.
- 4 Normal Packs for **\$95.00** ea.
- 8 Normal Packs for **\$90.00** ea.

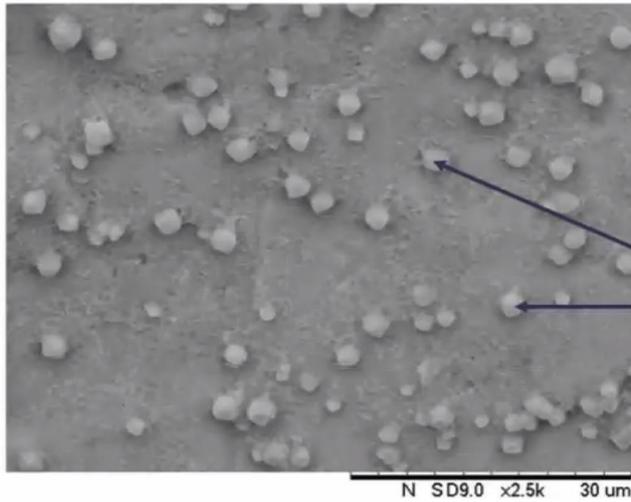


### **Bulk Packs** (300 x 0.5ml)

Choose from Mint, Berry or Unflavored

#### **Buy:**

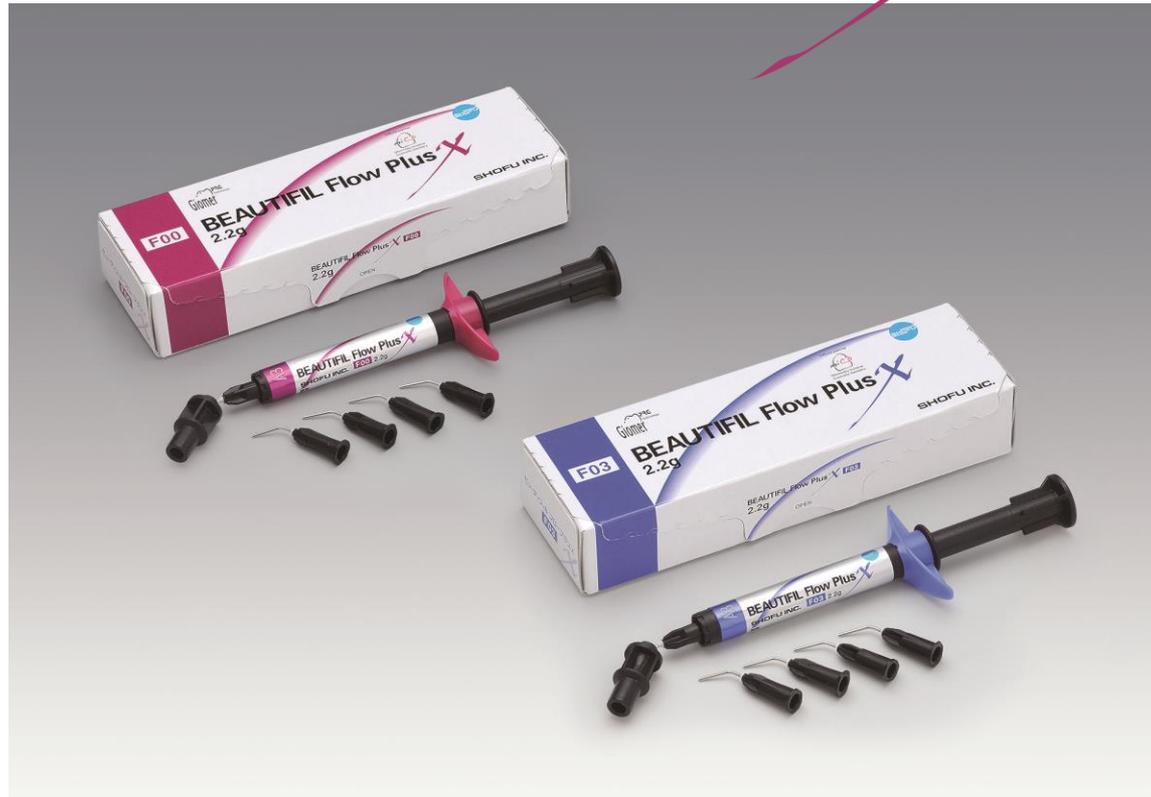
- 1 Bulk Pack for **\$320.00** ea.
- 4 Bulk Packs for **\$288.00** ea.



After treatment, Profisil deposits fluoride rich mineral on the surface of enamel

Top-down image of the tooth after treatment with Profisil.

# BEAUTIFIL Flow Plus X



Official partner



Ion releasing injectable hybrid resin



Questions?



# A New Era of Group Purchasing is Here

## Have you ever wondered...

How can I get better pricing as a practice owner?

Is there a way to receive higher PPO reimbursements?

How can I attract and convert more new patients?

Can I afford to offer insurance benefits to my team?

***We did too. So we decided to do something about it.***

## Meet Catapult Grow

*The educationally-driven Group Purchasing Organization (GPO) created by dentists, for dentists*

Catapult Grow is dedicated to helping independent dentists and small groups increase profitability and reach their full growth potential by increasing access and purchasing power with over 40+ curated industry partners. Members benefit from the Catapult Organization's 20+ years of industry experience and expansive partnerships to negotiate unparalleled value and savings across the entire dental landscape, from education, labs, supplies, credit card financing, employee benefits and so much more.



**A MEMBERSHIP WITH A SERIOUS ROI**

**Save tens of thousands for your practice without the extra work**



Break Time



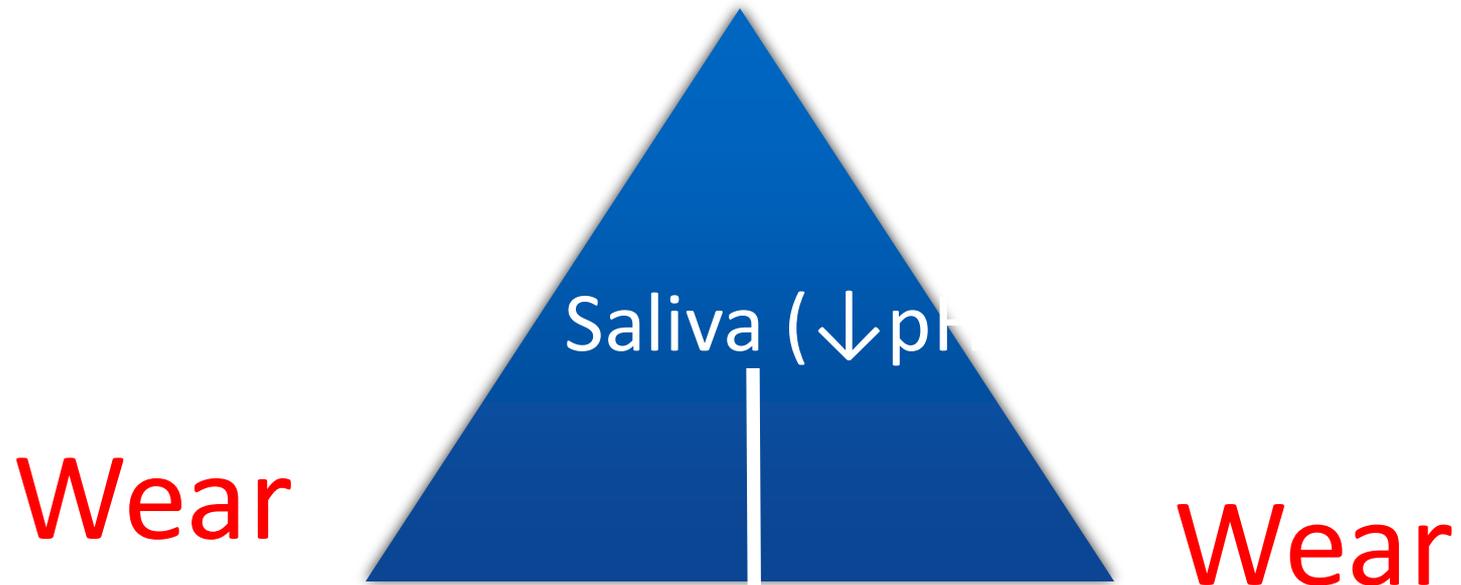
# THE ROLE OF *Saliva*





# Bruxism Triad

Wear



Erosive Tooth Wear

- Saliva; Watery substance located in the mouths of animals and is secreted by the salivary glands.
- Human saliva is 99.5 water and 0.5% of the following: electrolytes, mucus, glycoproteins, enzymes, antibacterial and antifungal components



# SALIVA FACTS:

- \* US (Resting) saliva flow = 0.2-0.4 ml/min
- \* Stimulated saliva flow = 1.0 ml/min
- \* 24 hour flow = 1.0L
- \* Nocturnal flow = 10% of daytime flow =
- xerostomia
- \* Decreased saliva flow with age (30-50%)



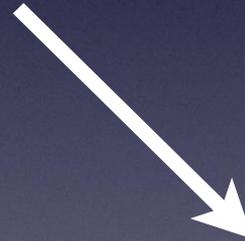
# THE **EROSIVE** PROCESS

Saliva



Acquired pellicle

pH



Tooth  
surface

Erosion begins:  
Dentin = pH 6.2  
Enamel = pH 5.5

# Etiology



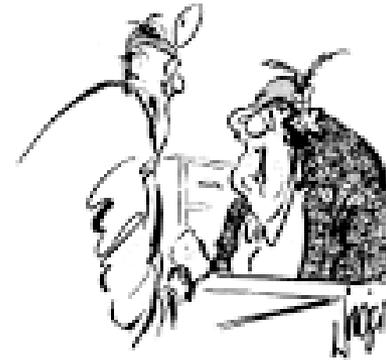
## Xerostomia Etiology

- Polypharmacy
- Head/ Neck /Radiation
- Sjogren Syndrome
- Mouth Breathers

A major risk factor in older patients is hypo salivation related to use of multiple medications



**I'm a walking drugstore!**



I feel a lot better now that I stopped taking all the pills you gave me!

Scully C, Oral Diseases 2003;9:165-176

# Xerostomia

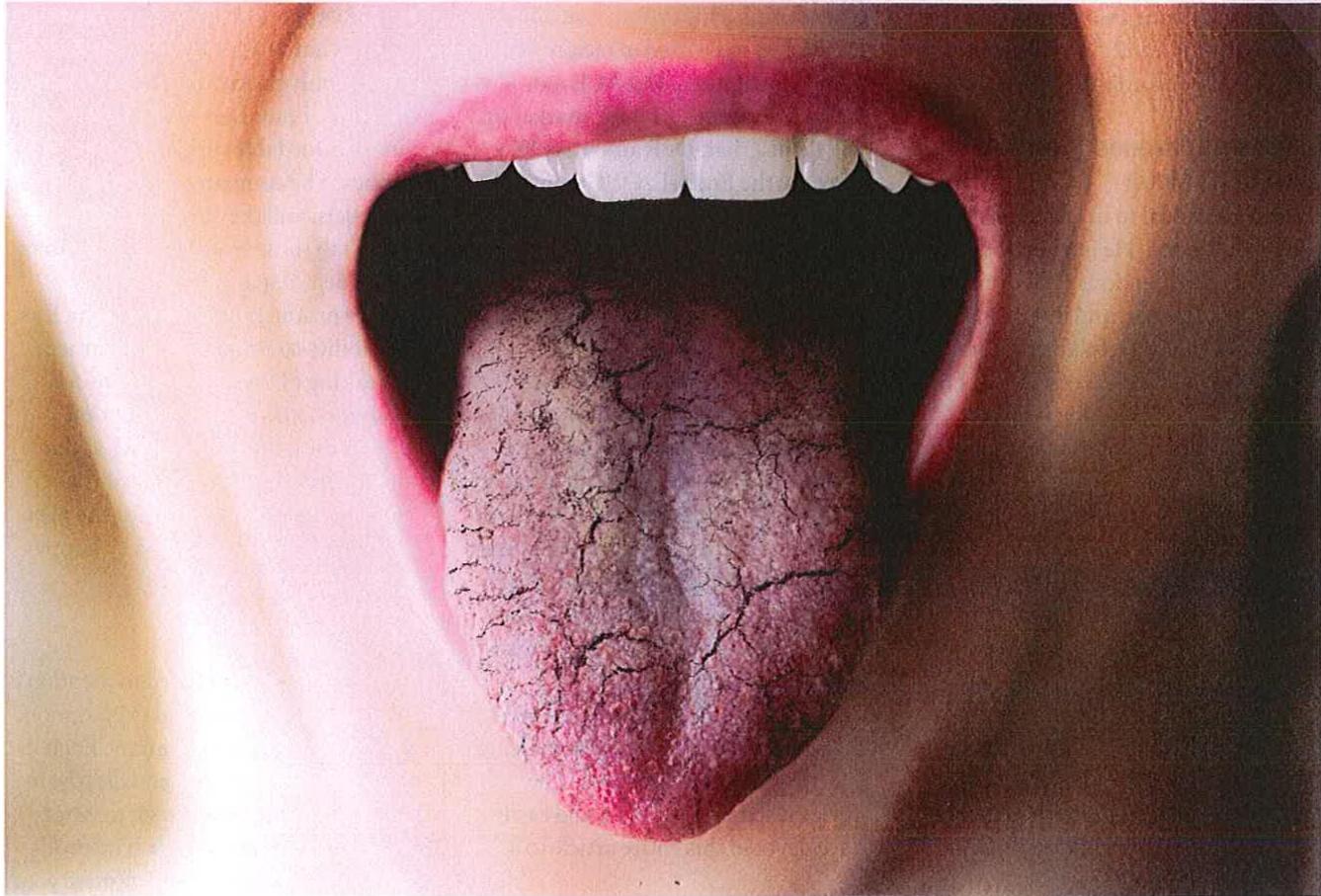
- Studies regarding decreased salivary flow with increasing age are unclear.
- Medications are the most common side effect but few objective studies are available. Personal report !!
- Radiation effect: Acinar cells are very susceptible to head/neck radiation. Damage is dose/field related. Squamous cell carcinoma receives on average 50-70Gy, parotid effected by 20 Gy or lower.
- Voutia. Portable water pump that delivers a continuous moisture stream to the oral cavity



# What can cause a decrease in the volume of saliva?

- \* Decrease in volume (Hyposalivation)
  - Medications
  - Systemic problems (Sjorgen's, diabetes)
  - Dehydration (Exercise)

PATIENTS CAN HAVE A DECREASE IN SALIVARY FLOW OF 40-60% AND NOT PERCEIVE A "DRY MOUTH".



Do You Have a  
Xerostomia Strategy?

# Sjogrens Syndrom

Cleveland Clinic estimated approximately 4 million patients in US with Sjogrens Syndrom.

Autoimmune disease that affects the entire body especially the eyes and oral cavity, usually accompanied by fatigue and chronic pain.. Dentally exhibited by increase in decay and periodontal disease.

# Customary Treatment

- Absence of a standard dental protocol
- Fluoride TP, 5000/million
- Salivary flow evaluation must be supported by saliva Ph, especially if  $< 6.5$
- Consider:
  - Xylitol
  - Saliva Buffering Kit (GC America)
  - XyliMelts
  - Fluori-Max TP with Xylitol
  - Water flosser, electric tooth brush, MI Paste(GCA)
  - HydraSmile.     Salivex 01



What can cause a  
increase in the  
volume of saliva?

- \* Acidic drinks or foods (gum)
- \* Masseter muscle activity (bruxism)
- \* GERD (esophageal-salivary reflex)

# DENTAL WEAR: ACID ATTACK DENTISTRY'S HIDDEN ENEMY

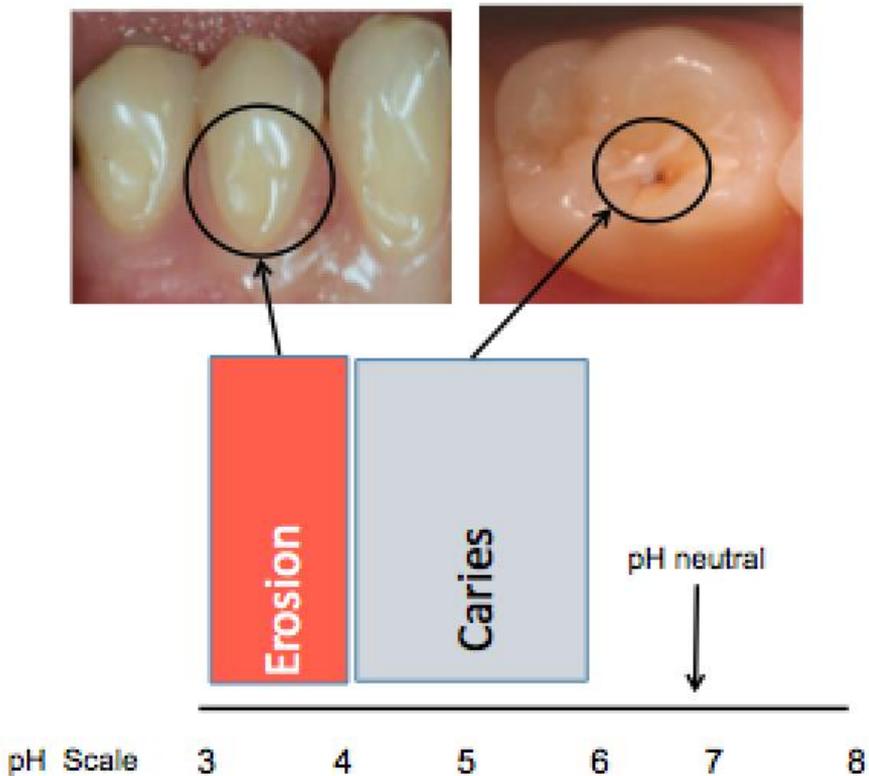


# LEARNING OBJECTIVES

- Disturbed sleep and general dentistry, possible paradigm shifts in your general dental practice.
- Tribology, what is it, what does it mean?
- Etiology of excessive dental wear.
- Bruxism, as a solo source of dental wear.
- Acid, intrinsic, extrinsic, effect on the dentition.
- Examine how your dental team views the oral acid attack from disturbed sleep and your concept of treatment.

# CARIES vs. EROSION

Both involve acid!



Caries:

- \* Involves bacteria
- \* Can be reversible
- \* Subsurface lesions
- \* pH => 4.5

Erosion:

- \* No bacteria-intrinsic/extrinsic acids
- \* Surface lesions/irreversible
- \* Subject to abrasion/wear

# Bruxism Triad

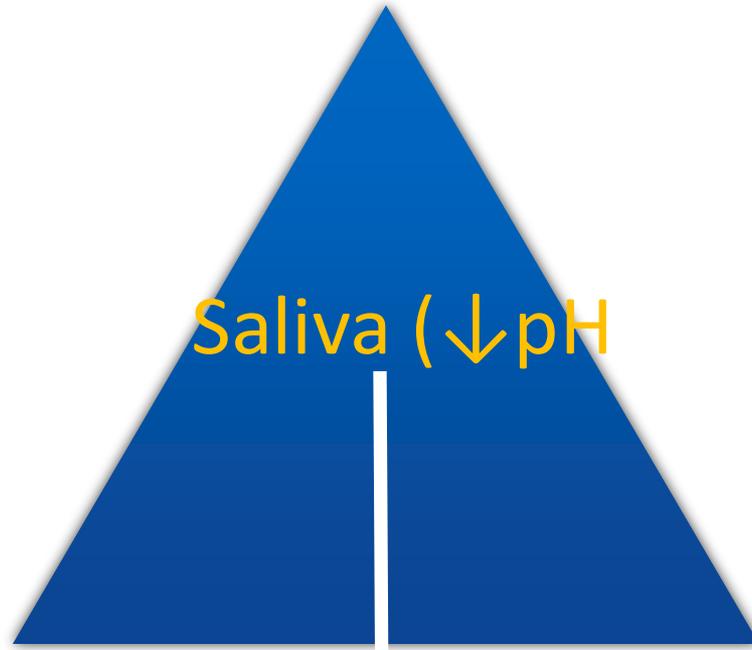
Wear

Saliva ( $\downarrow$ pH)

Wear

Wear

Erosive Tooth Wear



# Stephan Curve

- Saliva clearance:
- Responsible for acid clearance from the dental plaque due it's VELOCITY over the plaque along with increased sugar clearance,
- Why do we notice decay more frequently on the buccal surfaces of mandibular molars than the lingual

## Stephan Curve 1943

Exhibits the fall in pH below the critical level of ph 5.5 at which demineralization of enamel occurs following the intake of fermentable carbohydrates, acidic acids, or sugar in the presence of acidogenic bacteria

Bacteria convert the sugar to acid.



# The Perfect Dental Storm

Sleep Disturbances,  
Sleep Bruxing, GERD,  
Saliva, Erosion

Eugene Santucci DDS, MA, FACD

# THOUGHT!

The Perfect Storm:

GERD

Dry mouth

Sleep bruxism

Is bruxism the MAIN cause of wear in any of these cases?



In which of these images was the primary cause of tooth structure loss ----- bruxism?





# Wear-Tribology

- “The science of interacting surfaces in relative motion, involving lubrication, friction, force, hardness, roughness and speed.”

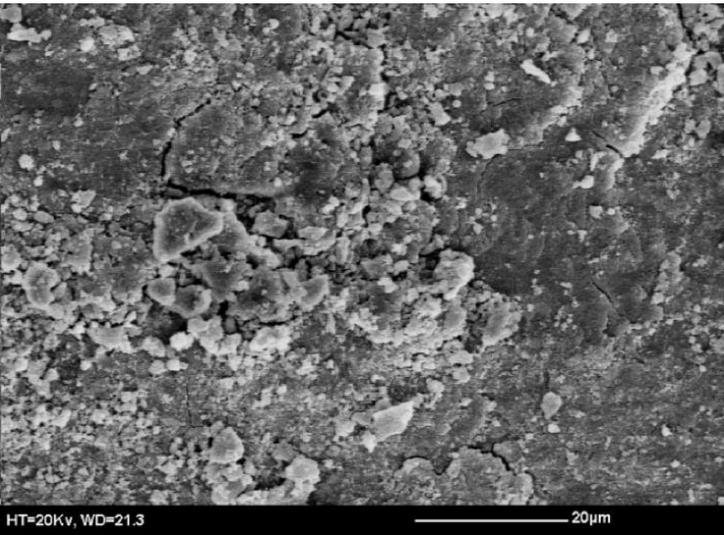
## TRIBOLOGY:

### The Science of Wear, Friction and Lubrication

Two-body wear: Upper and lower teeth rubbing together with only saliva between. (Sleep bruxism, awake clenching) **ATTRITION**

Three-body wear: Upper and lower teeth rubbing together with a slurry between. (abrasive food, toothbrush abrasion with dentifrice) **ABRASION**

ATTRITION: two-body abrasion with two moving surfaces in contact. Wear is caused by the breaking away of enamel asperities.



**TABLE 4**  
CALCULATED VERTICAL WEAR (IN  $\mu\text{m}$ ) *PER YEAR* FOR  
SEVERAL TIME PERIODS

Period	Premolars	Molars
12 to 24 months	18	38
24 to 36 months	15	29
36 to 48 months	16	28

(30 years = 1.0mm)  
Assuming no acid!

Eisenburger & Addy, *JDent*, 2002

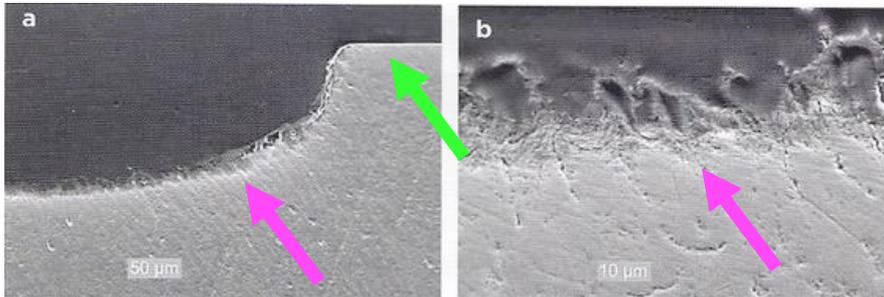
Lambrechts, et al., *JDentRes*. 1989

From a dental point of view, WEAR (TSL) involves  
ATTRITION (BRUXISM), ABRASION and  
ACID EROSION (CORROSION)



# Tooth surface loss (TSL) involves two distinct processes:

- \* **Acid erosion**- dissolution  
- softening
- \* **Wear**- frictional loss due to attrition, abrasion and abfraction=add'l TSL



Ganss, et al, MonoOralSci. 2014

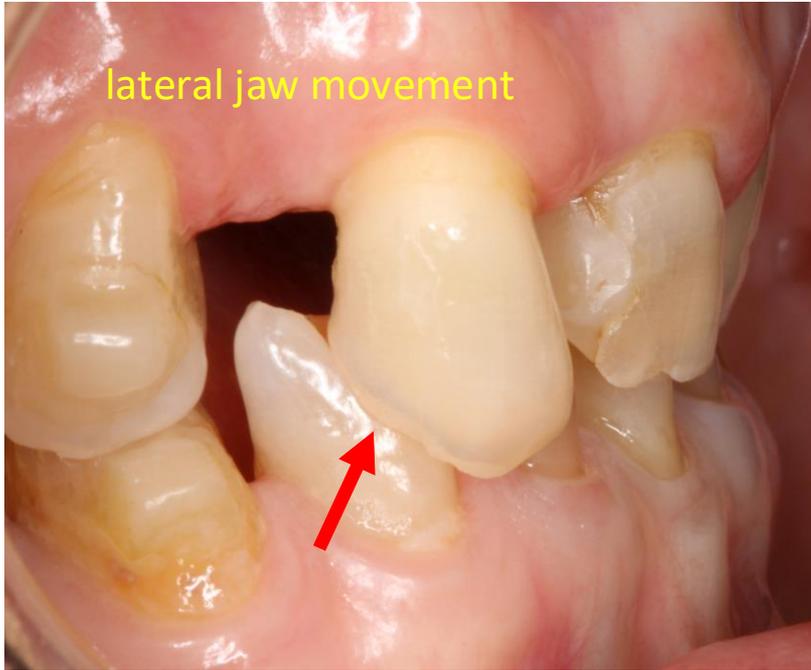


# Mechanisms Related to Tooth Wear

Chemical: Softening of tooth surfaces (enamel and dentin) by dietary and intrinsic acids

Mechanical: TSL related to attrition, abrasion (bruxing) and abfraction

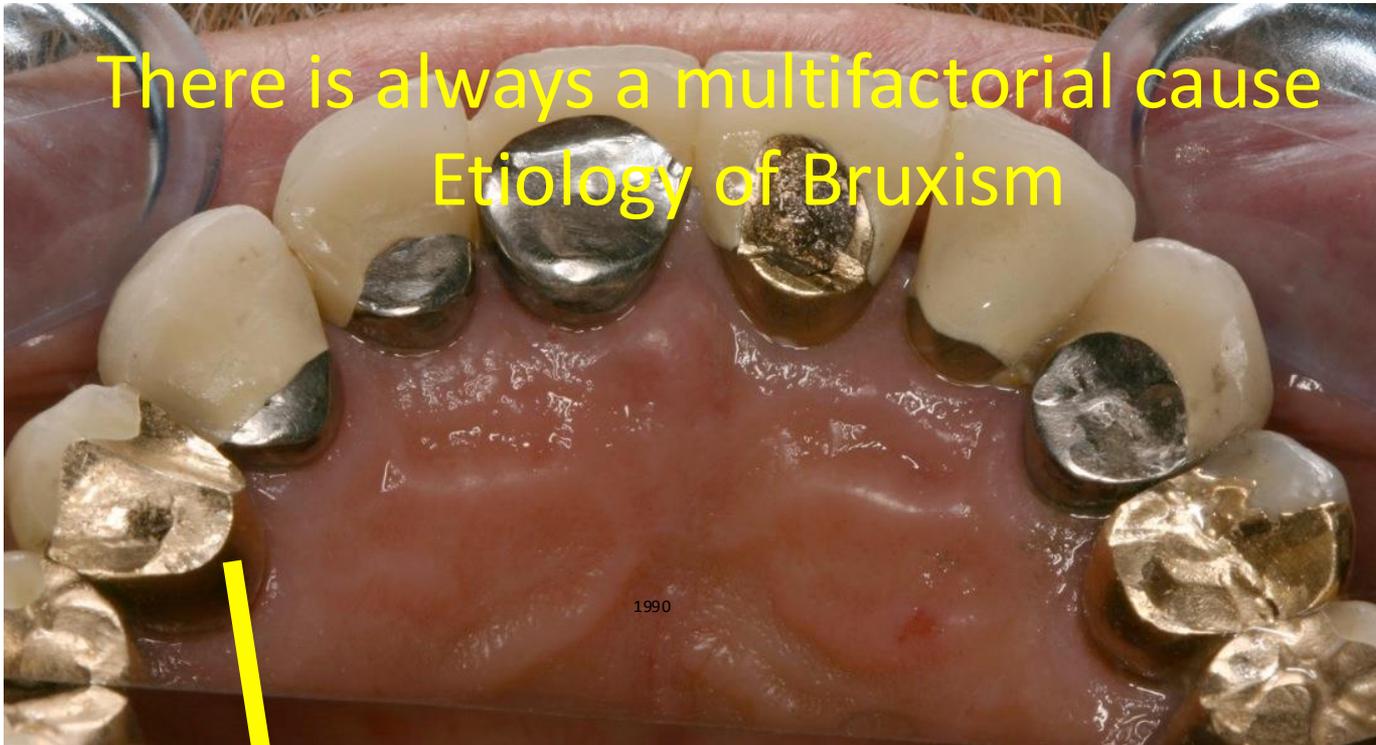
Behavioral: TSL related to tapping, nail-biting, etc.



Attrition?  
Bruxism?



There is always a multifactorial cause  
Etiology of Bruxism

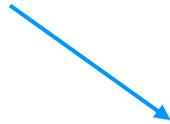




# THE EROSIVE PROCESS

Nothing happens on the tooth until it happens in the saliva!

Saliva



Acquired pellicle



Tooth surface

Erosion begins:  
Dentin = pH 6.2  
Enamel = pH 5.5

Severity of acid attack depends on:

- \* pH of acid
- \* Buffering capacity of saliva
- \* Is drink 'swished' or sipped, vs. gulped
- \* **Contact time** - fruit that is 'mulled'
- \* Saliva -dilution, clearance (dehydration)
- \* Thickness of pellicle

Ask your patients "HOW" they consume their acidic drinks, not just "WHAT" they consume!

# ACID EROSION

The chemical dissolution of dental hard tissues without bacterial involvement

Extrinsic



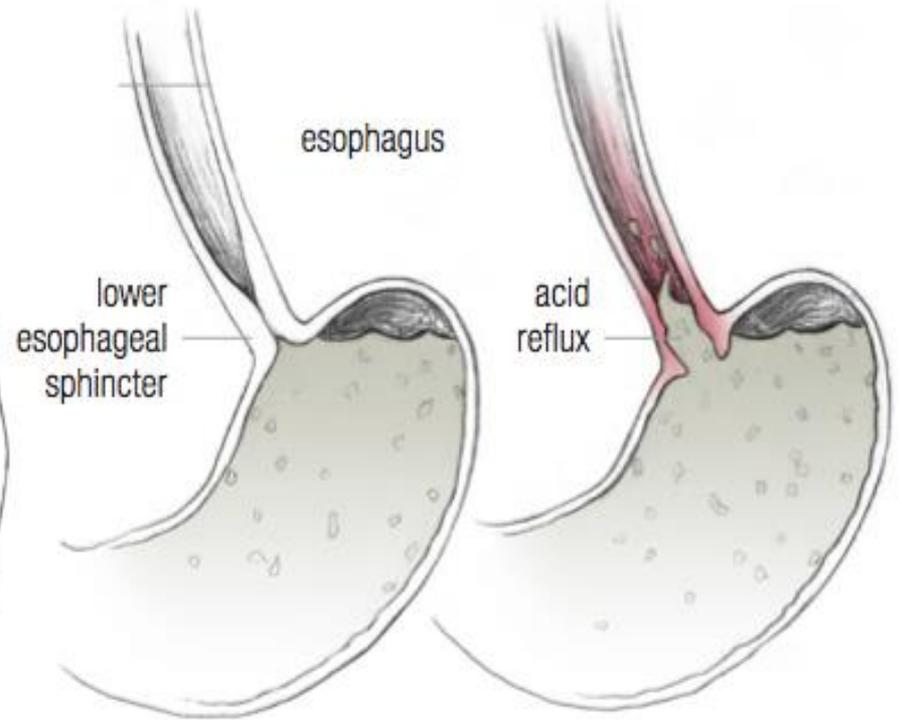
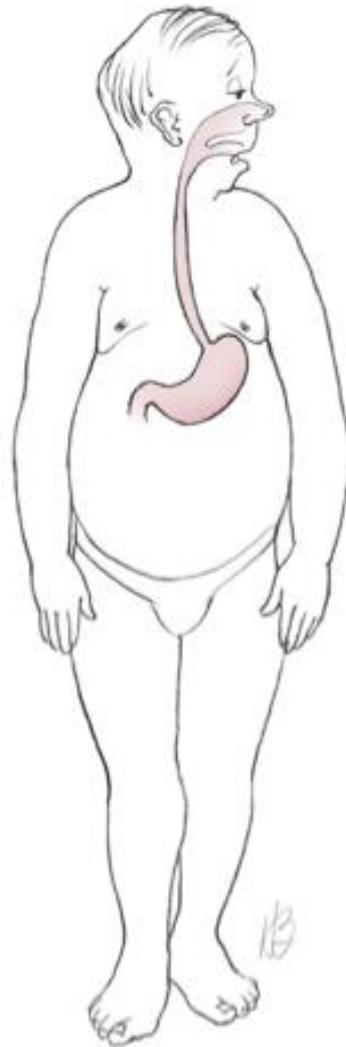
Intrinsic

# Intrinsic Acids

- Acids originating in the stomach (HCl)
- Can be related to:
  - GERD
  - Bulimia
  - Anorexia
  - Or several combinations



**G**astro  
**E**sophageal  
**R**eflux  
**D**isease

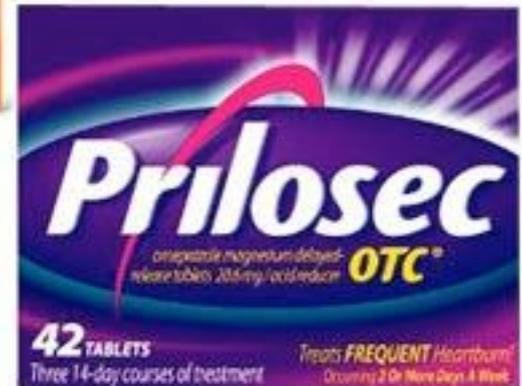


Gastric Reflux = pH 1.2

## Anti-acids



## Proton Pump Inhibitors



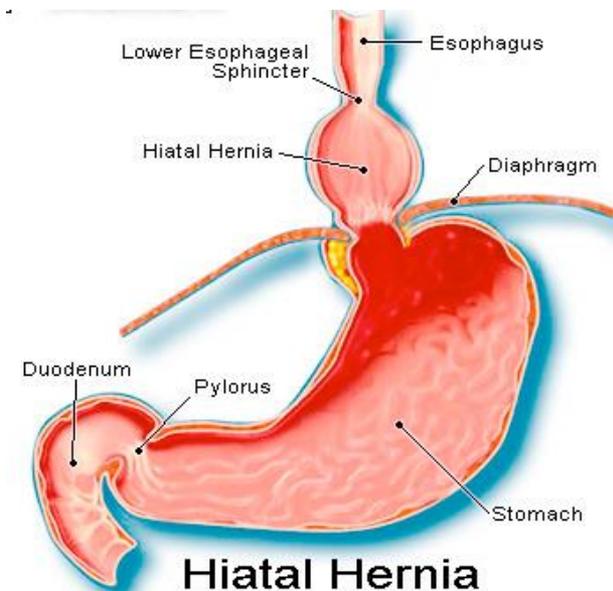
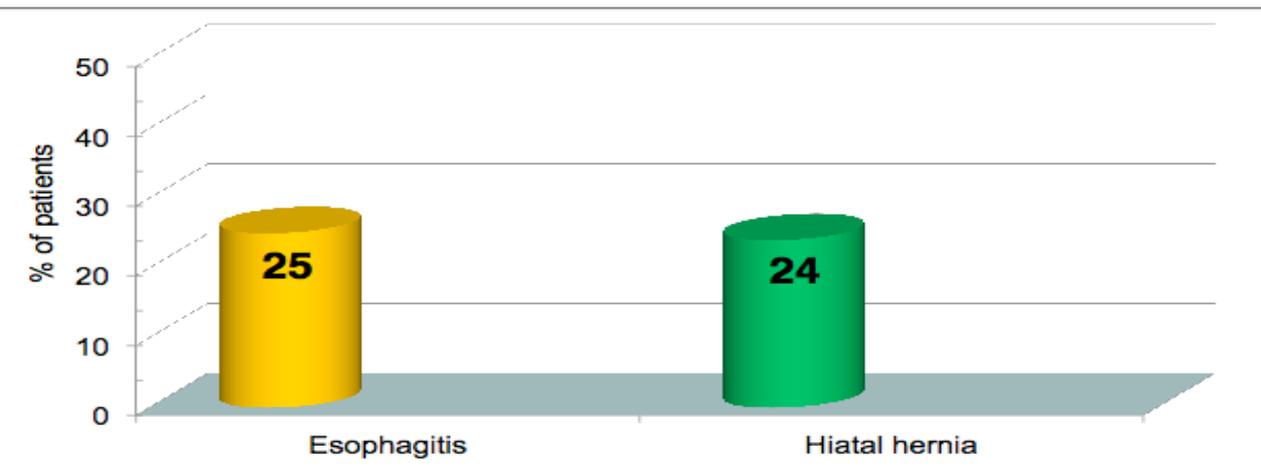
PPIs:  
>100 Million  
Rx/year(US)  
\$14 Billion in sales  
Possible Vitamin B-12  
deficiency after 2  
years.

# Zantac Lawsuit



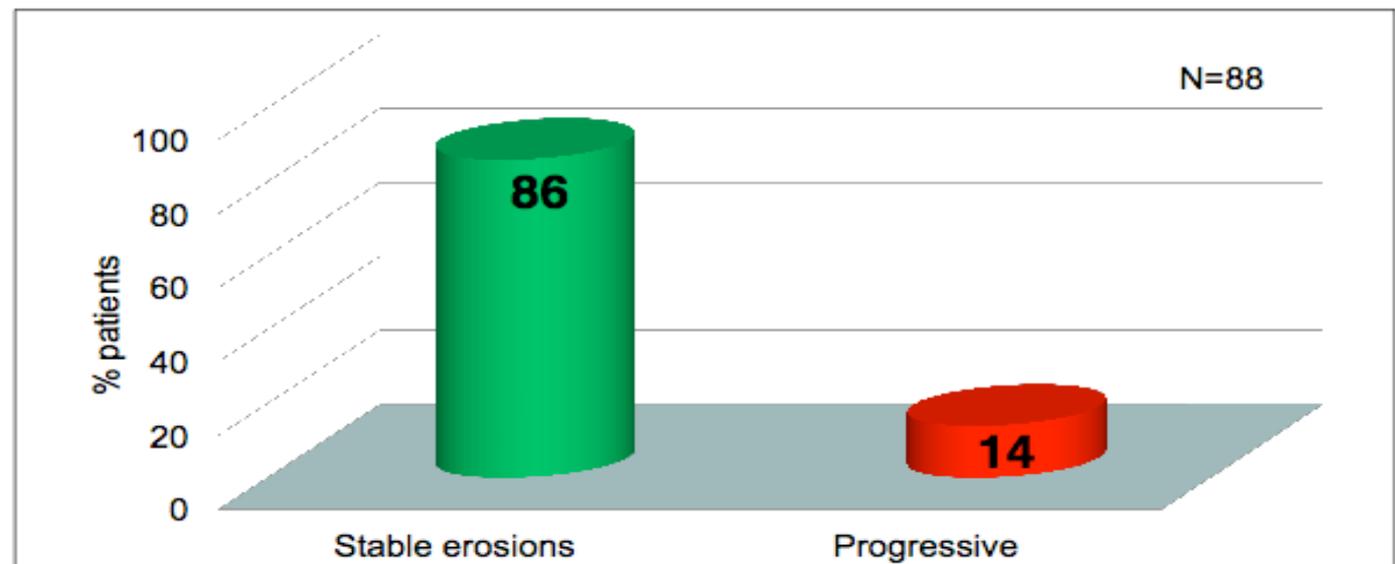
- Products with Ranitidine are linked to various forms of cancer such as bladder, colon and prostate .
- Zantac contains Ranitidine, heart burn , acid reflux medicine

## 6. Results: Endoscopic findings in dental erosion patients n=214



## 7. Results: Dental follow-up (3±1.8 yrs) on esomeprazole 20mg bid

w/ PPI Tx,  
86% were  
stable



Wilder-Smith  
& Lussi, 2013

# EXTRINSIC ACID EROSION

- 1. Fruits**
- 2. Juices**
- 3. Soft Drinks**
- 4. Sports Drinks**
- 5. Vitamin C Tablets**
- 6. Industrial**
- 7. Chlorinated Water**
- 8. Medications**



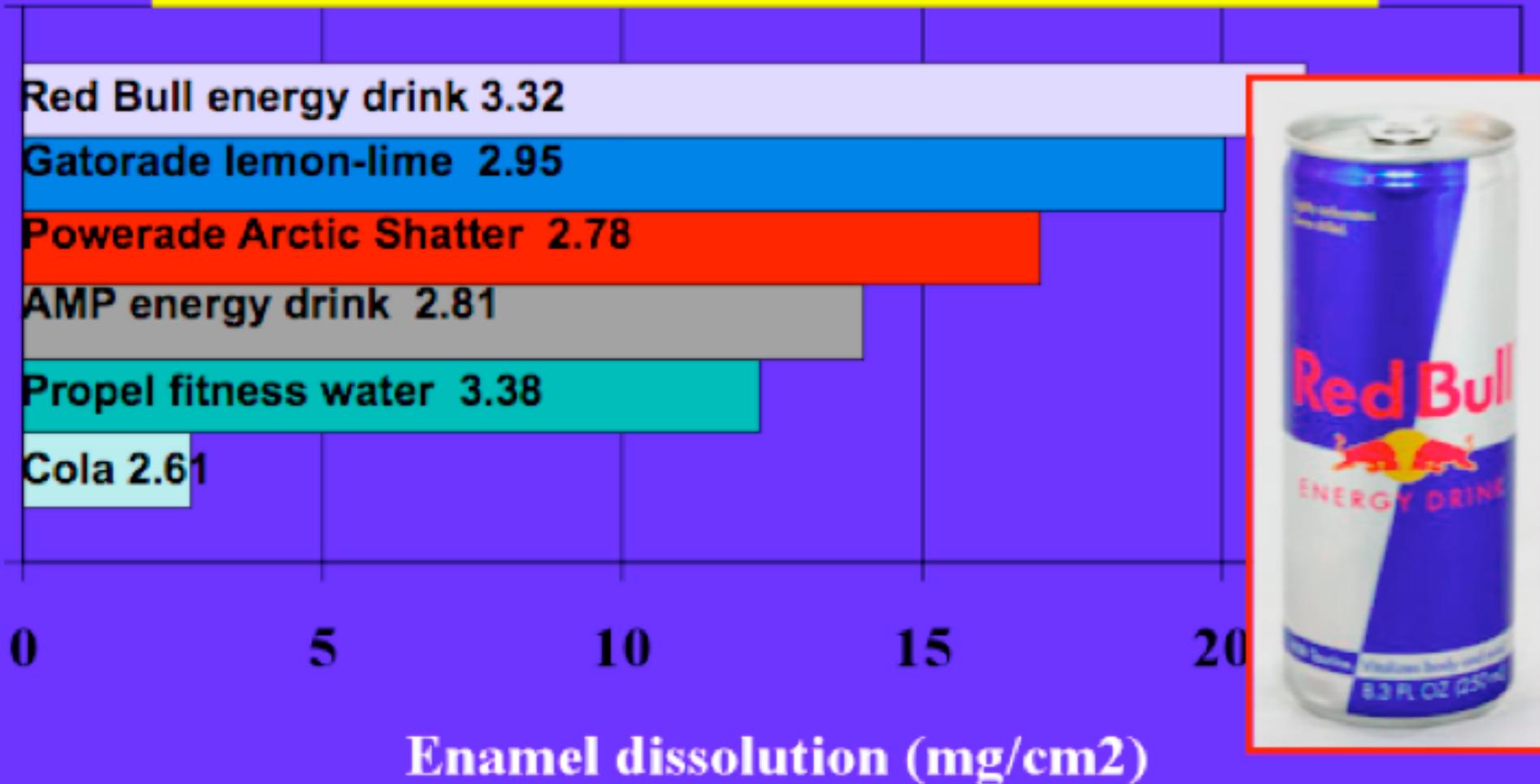


# Why Is It Important to Diagnose Erosive Tooth Wear?

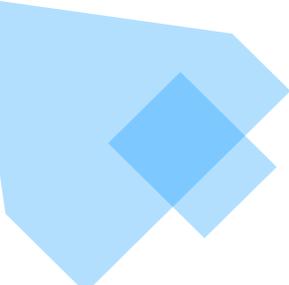
- Prevalence is increasing, especially among children, adolescents and the elderly
- Contributing factor is the increase consumption of sodas and energy drinks



# Mean enamel dissolution over 14 days in energy (sports) drinks



Sports drinks = 10X worse than coke  
Energy drinks = 13 times worse than coke



## Evaluation of Enamel Volume Loss after Exposure to Energy Drinks

Karen A. Schulze, Noëlle M. Santucci, Bina Surti, Stefan Habelitz, Mouchumi Bhattacharyya, Warden Noble

*Oral* 2024, 4, 101–112

<https://doi.org/10.3390/oral4010009>

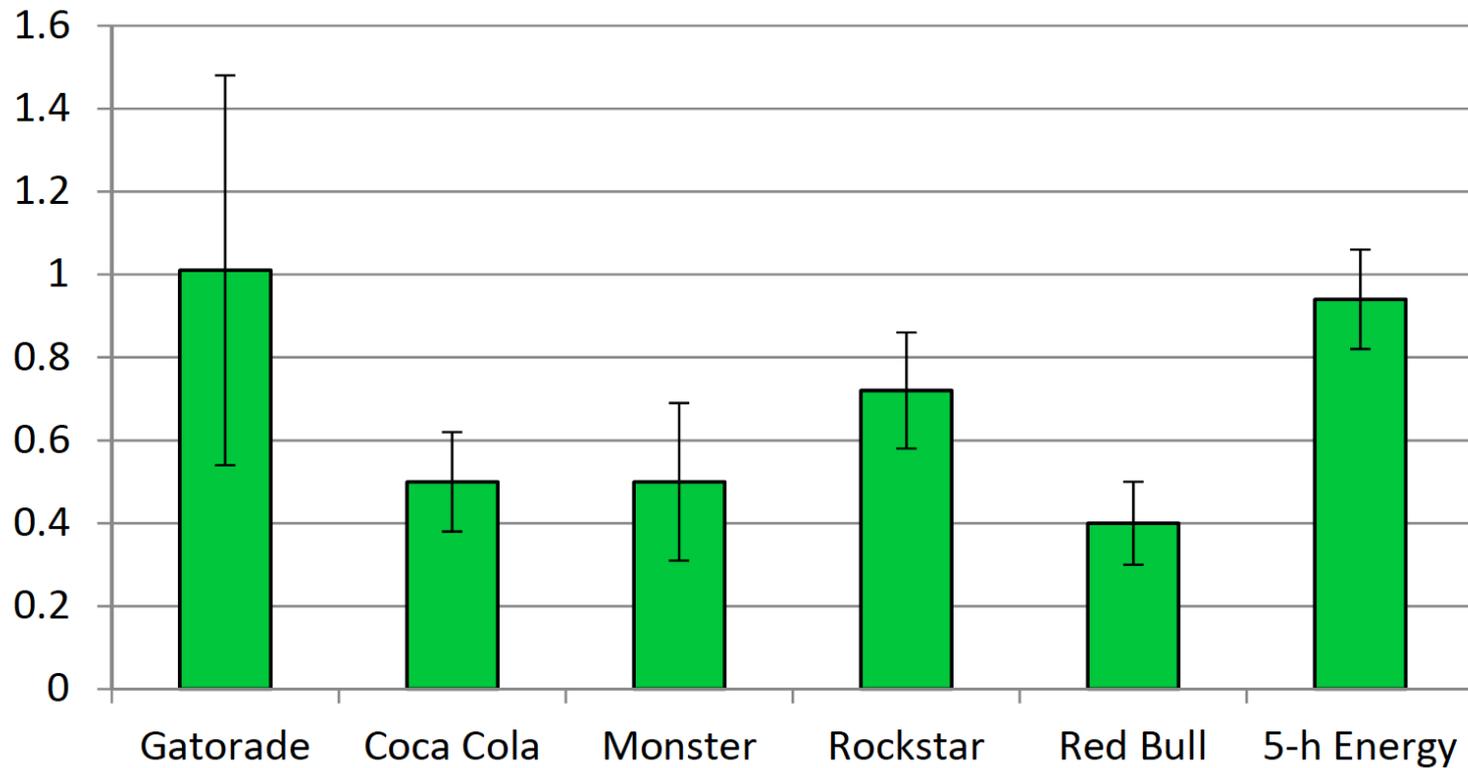


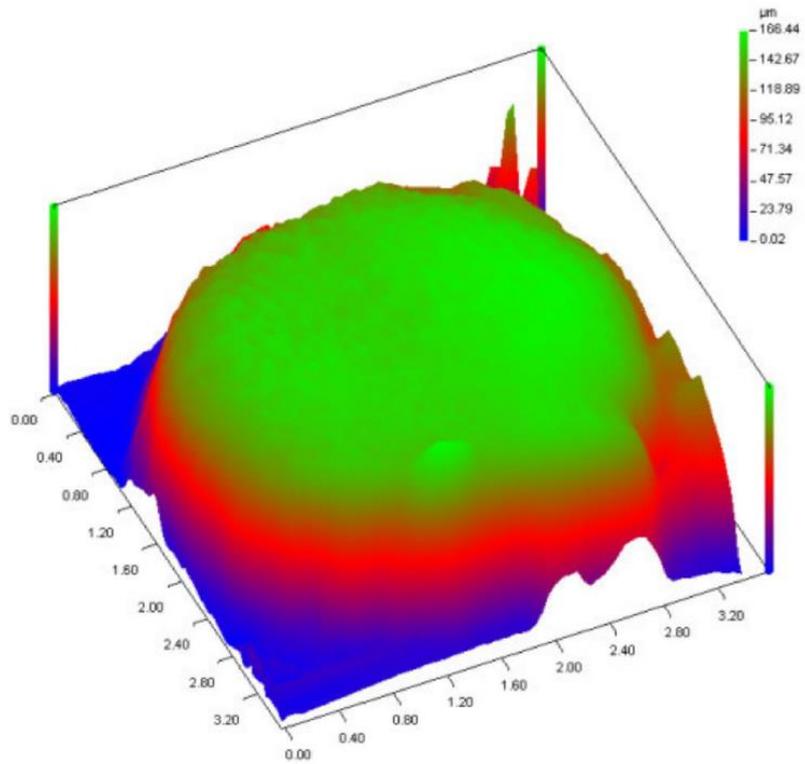
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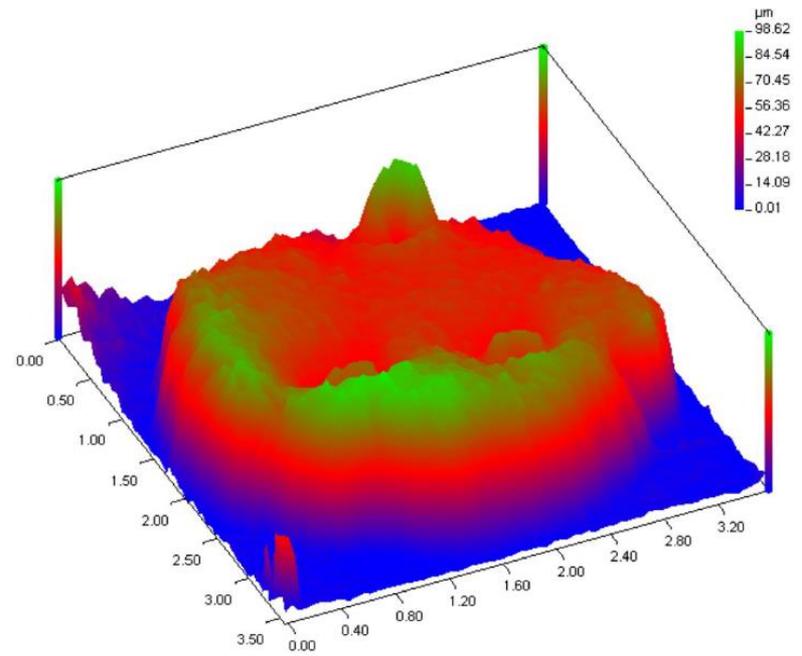


# Volume Loss in mm<sup>3</sup>





**(a)** 3D image of a Gatorade sample

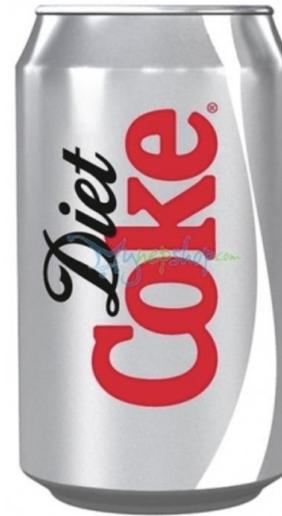


**(b)** 3D image of a Coca Cola sample

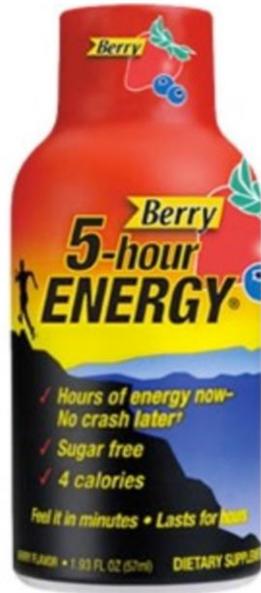
μm  
107.27

μm  
111.99

Which drink is most damaging to oral health??



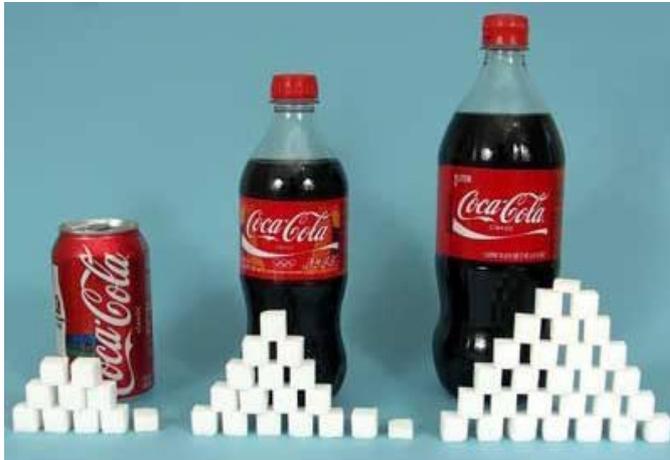
Which of these drinks is the **LEAST** erosive?



## Behavioral Modification

- \* Diet (acid intake: SSB's, energy and sports drinks, wine. etc.)
- \* Saliva (medications, dehydration, age, etc.)
- \* GERD
- \* Bruxism
- \* Sleep Apnea





Beverage	pH
Pure Water	7.0
Milk	6.6
Tea	6.2
Coffee and milk	5.3
Black coffee	5
Tomato Juice	3.7
Sprite	3.29
Diet Pepsi	3.03
Gatorade	2.92
Dr. Pepper	2.90
Fruit Punch	2.82
Orange Juice (Minute Maid)	2.64
Coke Classic	2.53
Reference: Battery Acid	1.0

\*Sources: University of Ottawa; General Dentistry, March/April 2007; preventdisease.com



## Supplement Facts

Serving Size 8.0 fl.oz. (240 mL)  
Servings Per Container: 2

Amount Per Serving	% Daily Value	
<b>Calories</b>	<b>100</b>	
<b>Total Carb</b>	<b>27g</b>	<b>9%*</b>
Sugars	27g	†
Riboflavin Vit B2	1.7mg	100%
Niacin Vit B3	20mg	100%
Vitamin B6	2mg	100%
Vitamin B12	6mcg	100%
Sodium	180mg	8%
Taurine	1000mg	†
Panax Ginseng	200mg	†
Energy Blend	2500mg	†
L-Carnitine, Glucose, Caffeine, Guarana, Inositol, Glucuronolactone, Maltodextrin		

\*Percent Daily Values are based on a 2000 calorie diet. † Daily Value not established.



160g caffeine

Approx. 4 g. sugar=1.0 tbs  
So, in Monster drink 27g.=6+tbs  
sugar  
Coke has 39g. sugar !

# DENTAL WEAR IS AN ACID DISEASE!

Management Strategies:

- \* **Control** acid contact to teeth
- \* **Protect** teeth from acid contact
- \* **Minimize** frictional forces

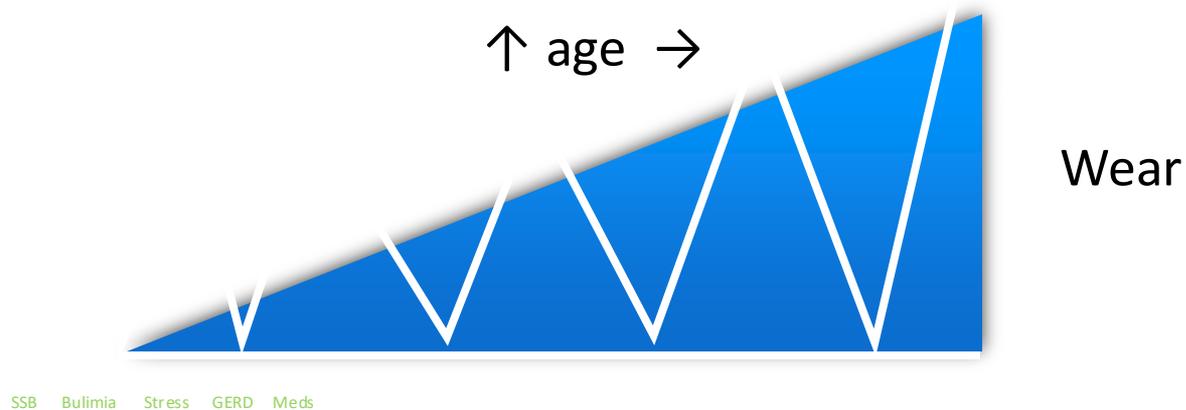
Thus, it involves more than just bruxism!

# Management of tooth wear: Early Detection vs. Extensive Treatment

Modify Environment by  
controlling acid

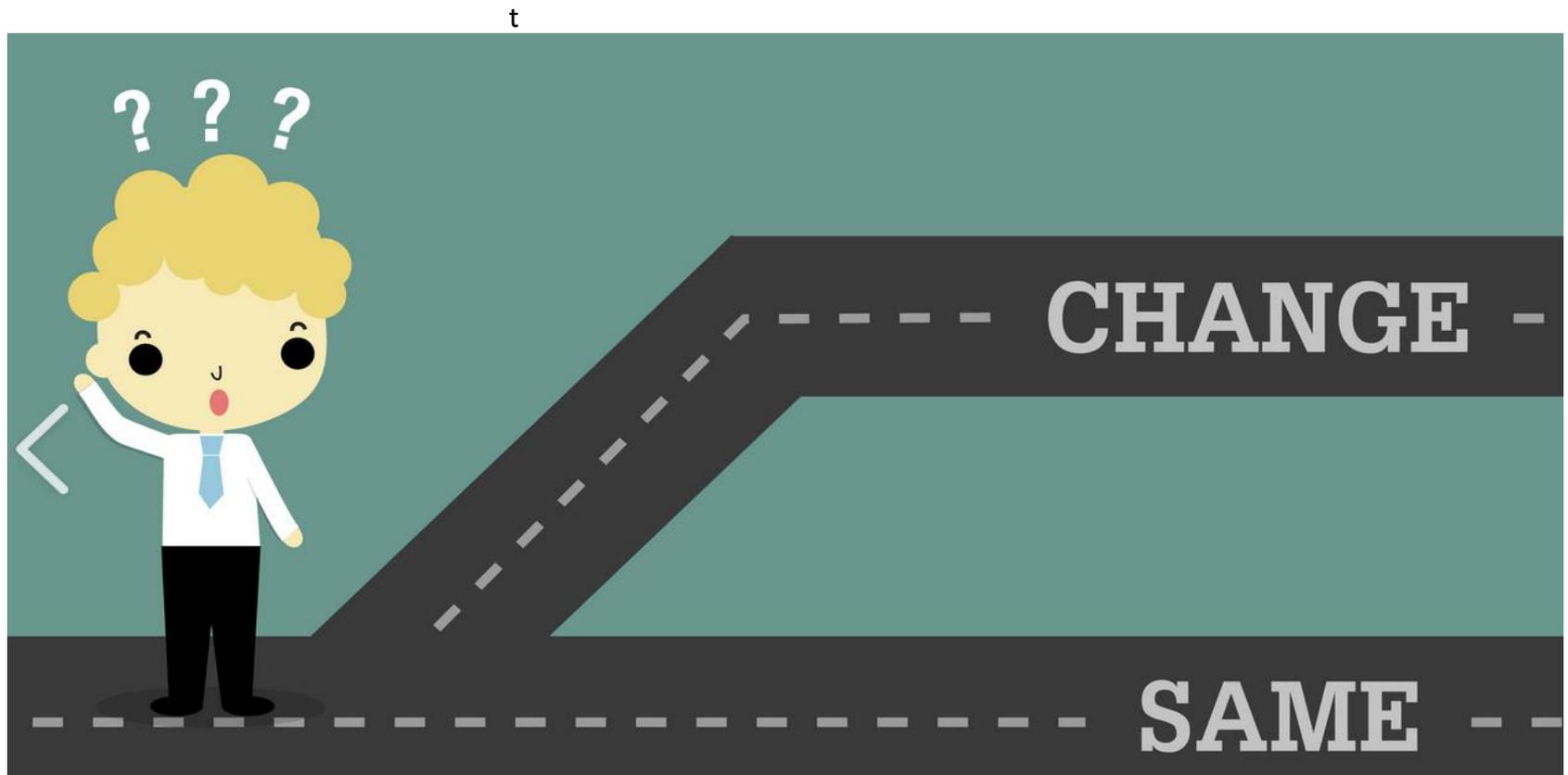
Behavioral modification

Why is it important to Dx ETW?  
ETW increases throughout life, but  
does not occur in a 'straight line'--it  
is episodic.



Problem: Etiologic factors change throughout life!

# Management of tooth wear: Early Detection vs. Extensive Treatment

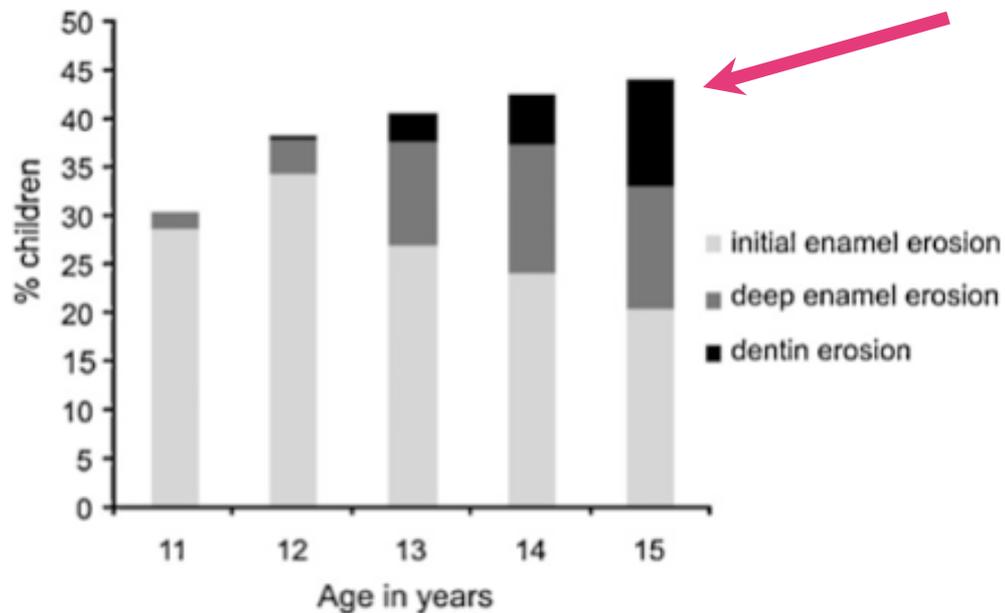


From a dental point of view, WEAR involves ATTRITION (BRUXISM), ABRASION and ACID EROSION (CORROSION)



# Prevalence and Progression of ETW

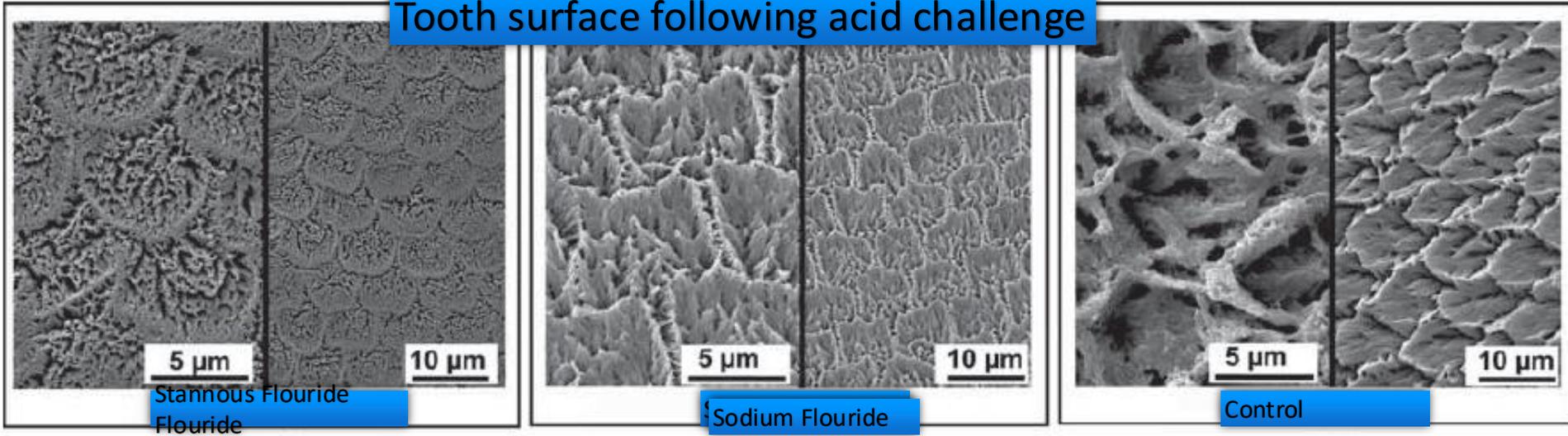
## Dynamics of tooth erosion in adolescents: A 3-year longitudinal study



El Aida, et al, J Dent 2010;38:131-137.

# Brush before a meal, not after!!

Tooth surface following acid challenge

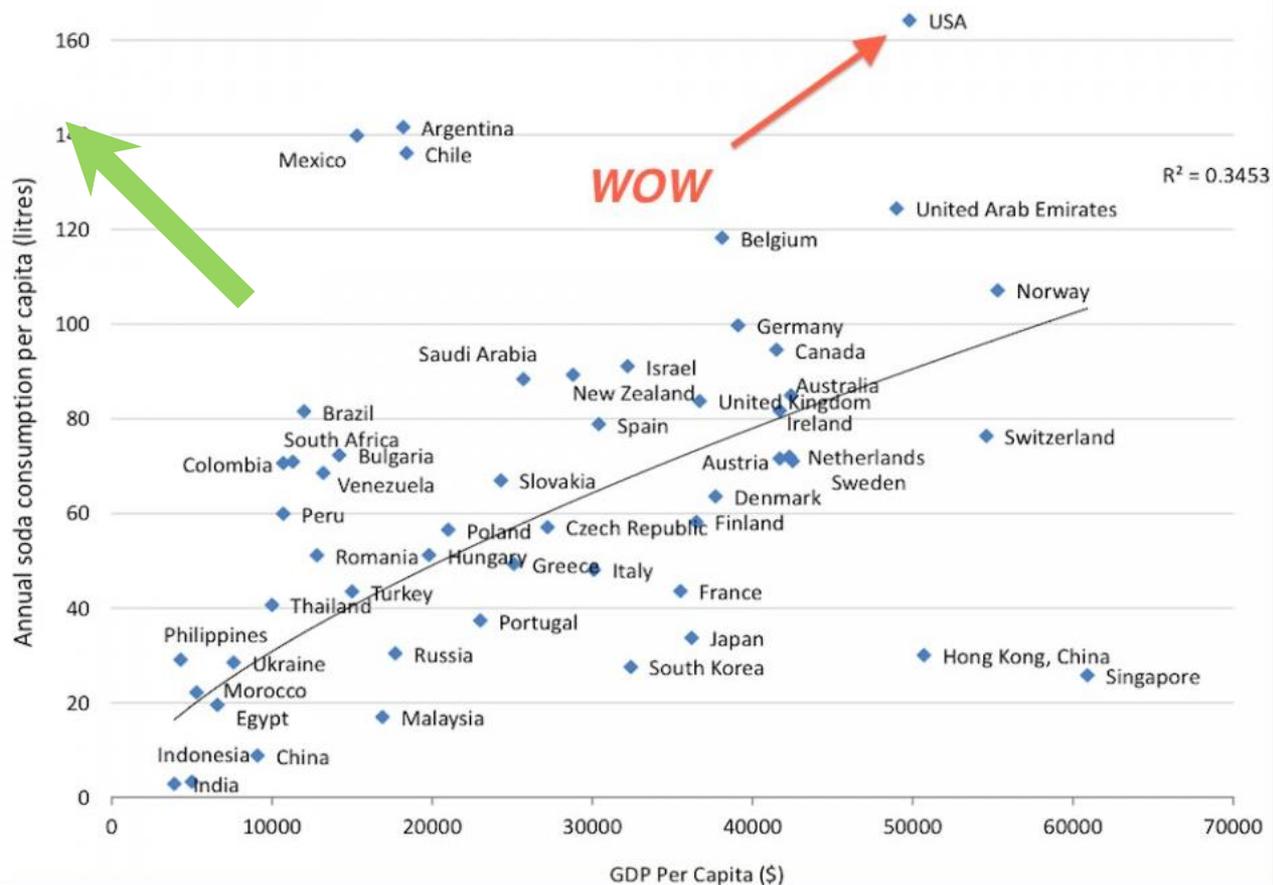


Ravishankar, Gen Dent  
2013;61:56-59



- Chewing cheese for 3 minutes increased pH greater than milk or yogurt
- Due to  $\text{Ca}^+$
- Increase in salivary flow

Figure 8: Annual global soda consumption versus GDP per capita



50 gallons/year  
(2018)

>40 gallons/year  
(2013)

Health effects!

<http://mobile.businessinsider.com/american-soda-consumption-a-huge-outlier-2013-9>

; Accessed 3/4/2016 (Credit Suisse Research)

Is bruxism the MAIN cause of wear in any of these cases?





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## LEARNING OBJECTIVES/ REVIEW

- Disturbed sleep and general dentistry, possible paradigm shifts in your general dental practice.
- Tribology, what is it, what does it mean?
- Etiology of excessive dental wear.
- Bruxism, as a solo source of dental wear.
- Acid, intrinsic, extrinsic, effect on the dentition.
- Examine how your dental team views the oral acid attack from disturbed sleep and your concept of treatment.

# Modify the Dental Environment



**Wear**

Bruxism Triad

Sleep Bruxism

**Wear**

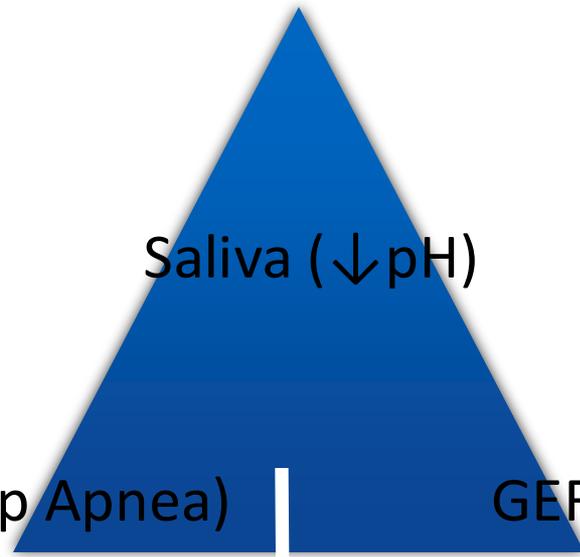
Saliva ( $\downarrow$ pH)

**Wear**

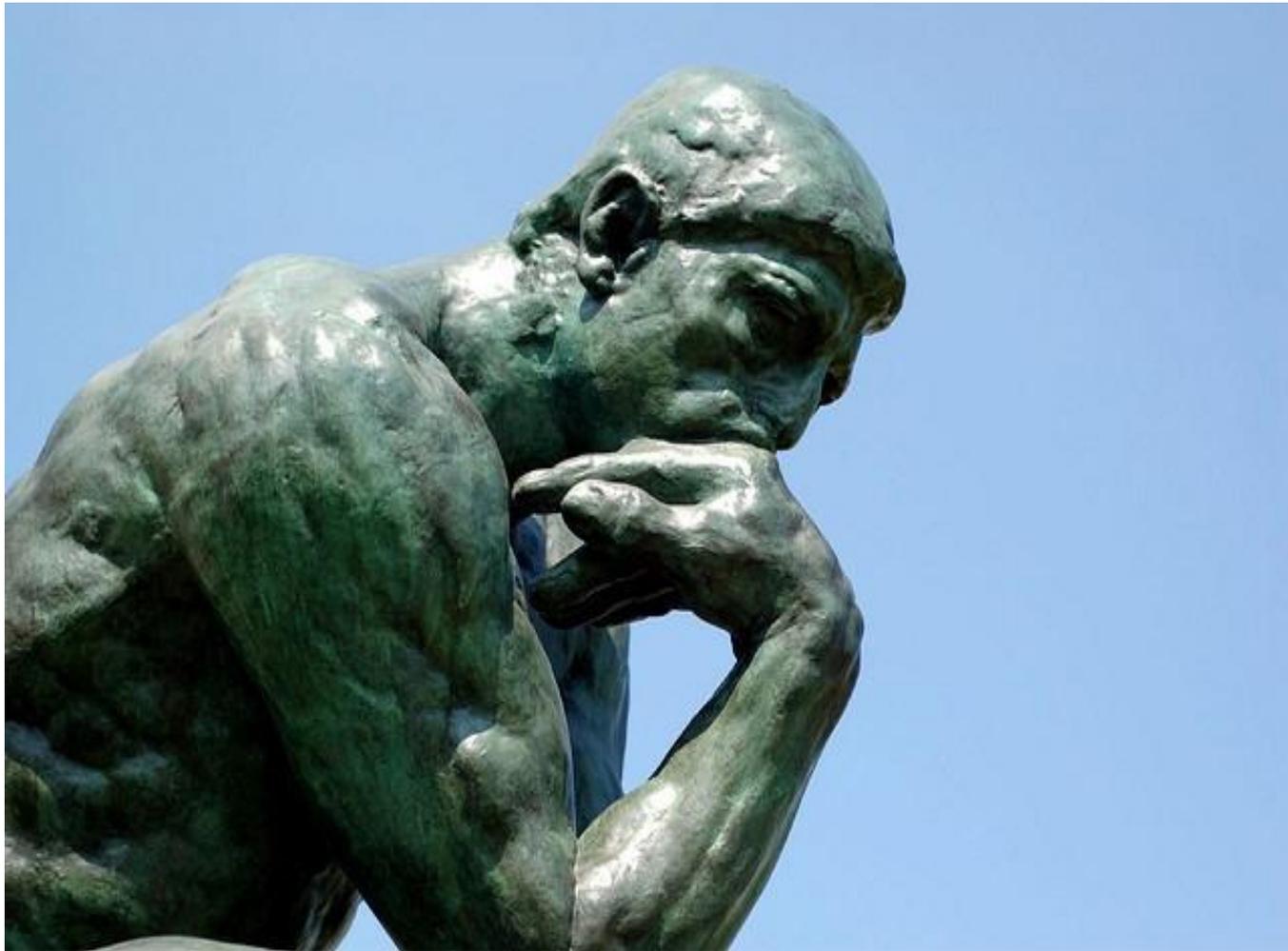
SDB (Sleep Apnea)

GERD

Erosive Tooth Wear

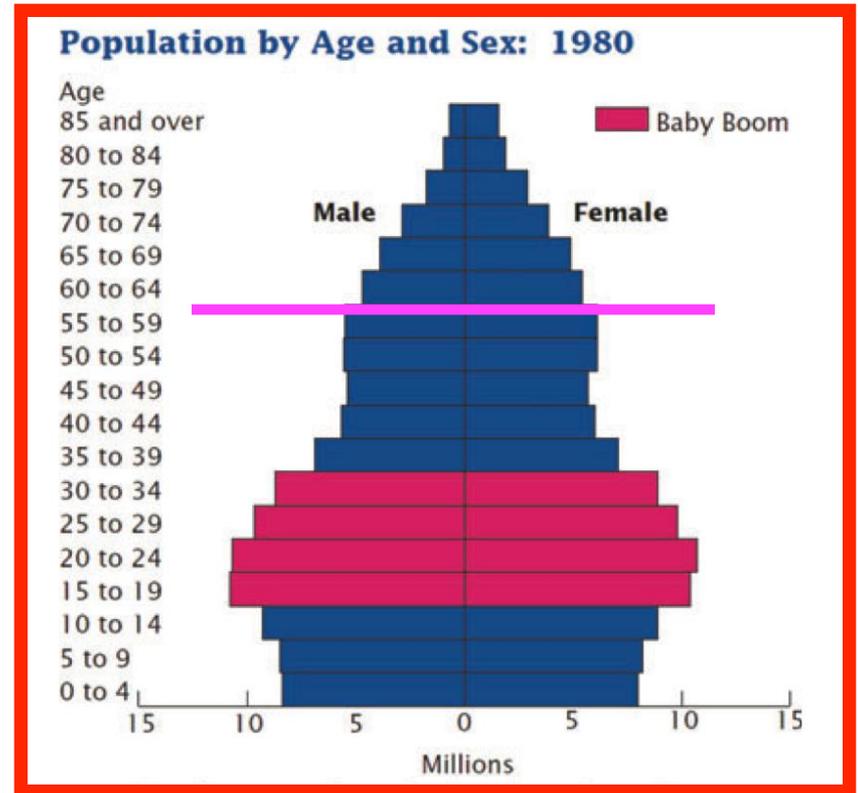
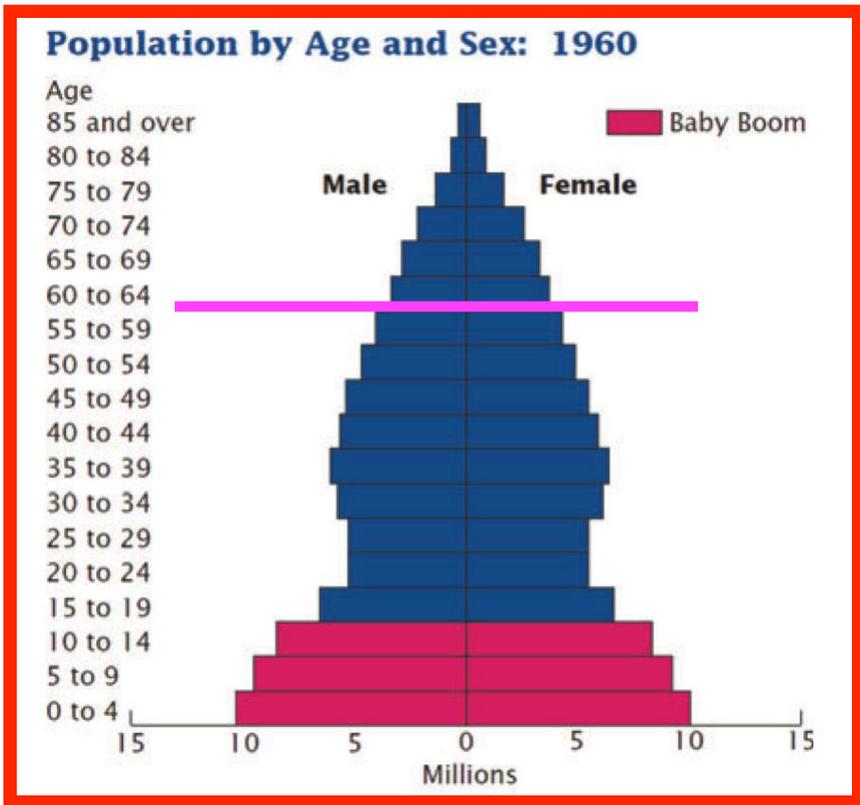


What is the Concern?

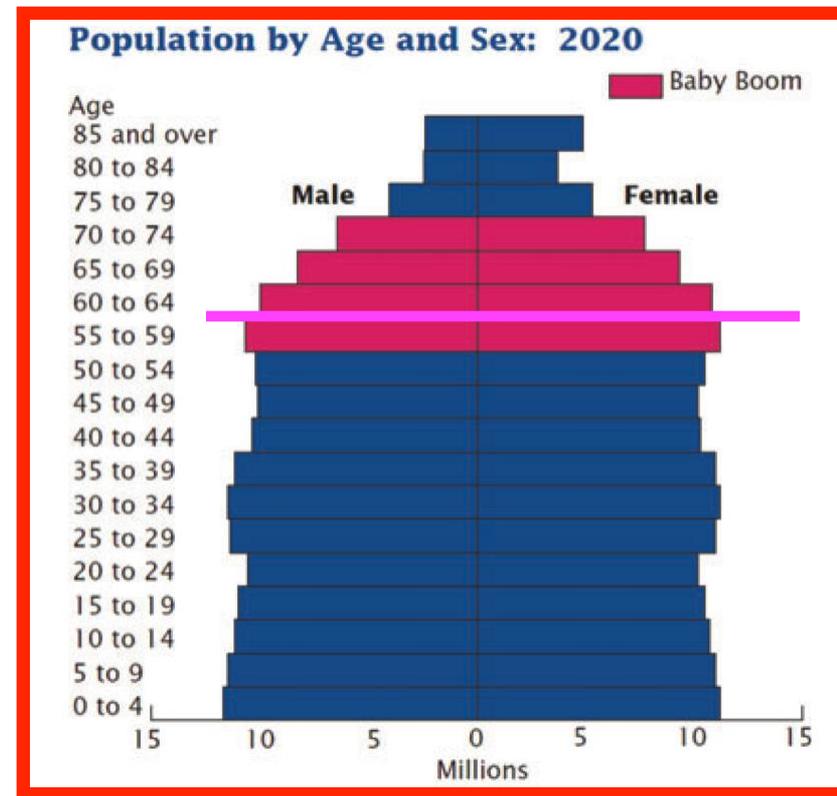
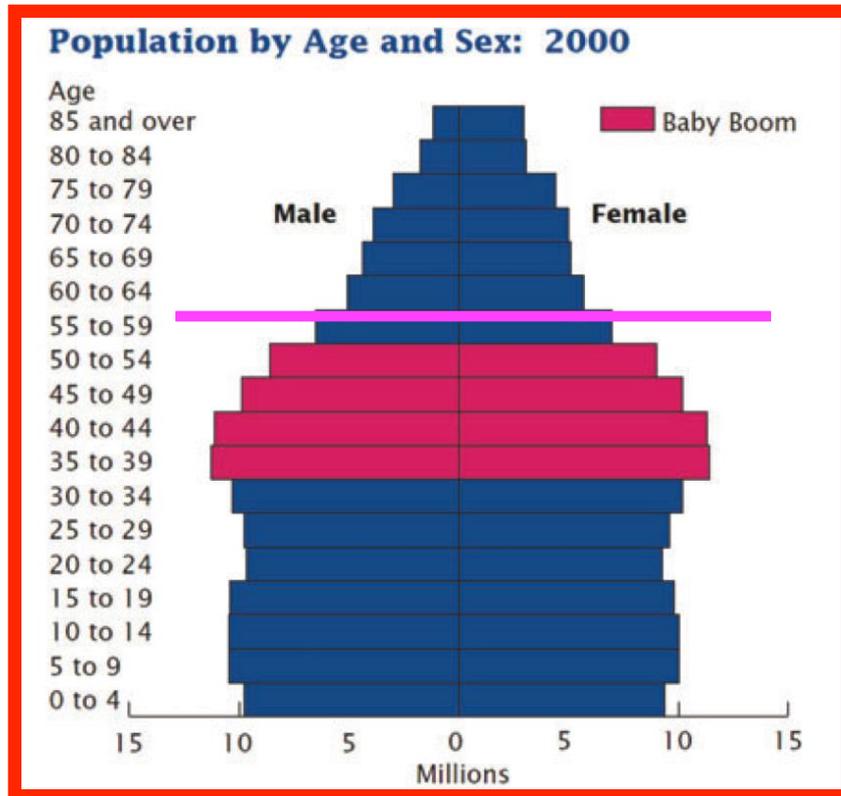




# DEMOGRAPHIC CHANGES

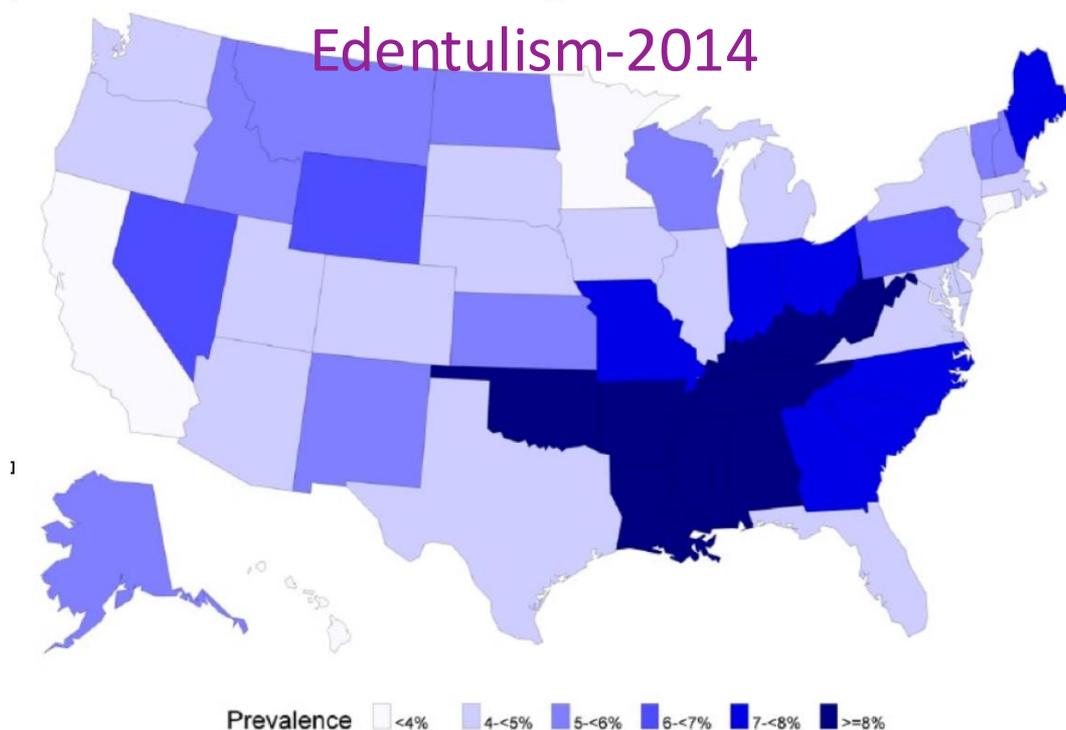


# DEMOGRAPHIC CHANGES



More people are living longer, keeping their teeth  
and are more affluent, active and esthetically sensitive!

1974: 45.6% edentulous  
1994: 28.6%  
2008: 22.9%  
2015: 17% (est.)  
(over age 65)



JDentRes 2014

# “The Perfect Storm”

A patient who is a bruxer, has sleep apnea, GERD and medication-induced hypo-salivation!!

## Patient Profile:

- \* Age 55+
- \* Obese
- \* Neck size 17+”
- \* Drinks and smokes
- \* High stress

Young slim females ????????

# DENTAL WEAR IS AN ACID DISEASE DISEASE!

Management Strategies:

- \* **Control** acid contact to teeth
- \* **Protect** teeth from acid contact

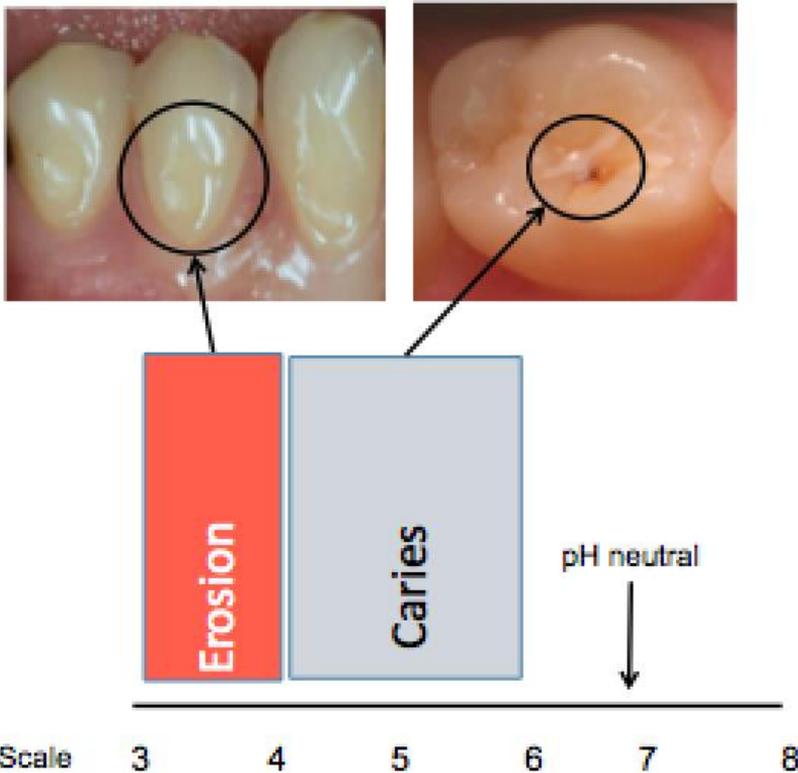
Thus, it involves more than just bruxism!

# Acid Erosion

The chemical dissolution of dental hard tissues without bacterial involvement



# CARIES vs. EROSION



Caries:

- \* Involves bacteria
- \* Can be reversible
- \* Subsurface lesions
- \*  $\text{pH} \Rightarrow 4.5$

Erosion:

- \* No bacteria-intrinsic/extrinsic acids
- \* Surface lesions
- \* Subject to abrasion/wear

# ENAMEL vs. DENTIN

ENAMEL: INORGANIC=85%  
ORGANIC=2%  
WATER=11%

DENTIN: INORGANIC=47%  
ORGANIC=33%  
WATER=21%

Ganss C, et al. *MonoOralSci* 2014;25:99-107

# ENAMEL vs. DENTIN

EROSIVE EFFECTS ON ENAMEL:  
MORE DEMIN AND BULK LOSS (HIGHER MINERAL  
CONTENT)

EROSIVE EFFECTS ON DENTIN:  
LESS BULK LOSS(LESS MINERAL) BUT SOFTER  
ORGANIC MATRIX (ABRASION)



Severity of acid attack depends on:

- \* pH of acid
- \* Buffering capacity of acid
- \* Is drink 'swished' or sipped, vs. gulped
- \* **Contact time** - fruit that is 'mulled'
- \* Saliva -dilution, clearance  
(dehydration)
- \* Thickness of pellicle

Ask your patients "HOW" they consume their acidic drinks!

# Review

- Erosion:
  - Enamel is susceptible to acid dissolution when saliva pH no longer is between 5.5 and 6.5.
- Acid Sources
  - Can be intrinsic
    - GERDS (pH 1.2), Bulimia
  - Can be extrinsic
    - Juice, wine, workplace acid fumes, medications, swimming pools
- Saliva Testing



# Risk Assessment

## RISK ASSESSMENT

- Dietary habits
- Frequency and amount of fluid consumption
- Sports and occupational exposure
- Gastroesophageal reflux (GERD)
- Bulimia and anorexia

Therefore, we will be seeing more patients with wear...they are literally 'outliving' their teeth!



Teeth softened by acid attacks can be 27 times more susceptible to abrasion (and attrition?) than normal teeth



Jaeggi and Lussi, CarRes; 1999

Think in terms of “EROSIVE TOOTH WEAR” and not just bruxism:

This will open a whole new area for improving a patient’s overall HEALTH, because signs and symptoms of wear are often related to things other than teeth.



# MANAGEMENT STRATEGIES

- \* Observe and wait
- \* Behavioral modification
- \* Apply fluoride
- \* Use sealant
- \* Restore



# Management Strategies

- Observe and wait

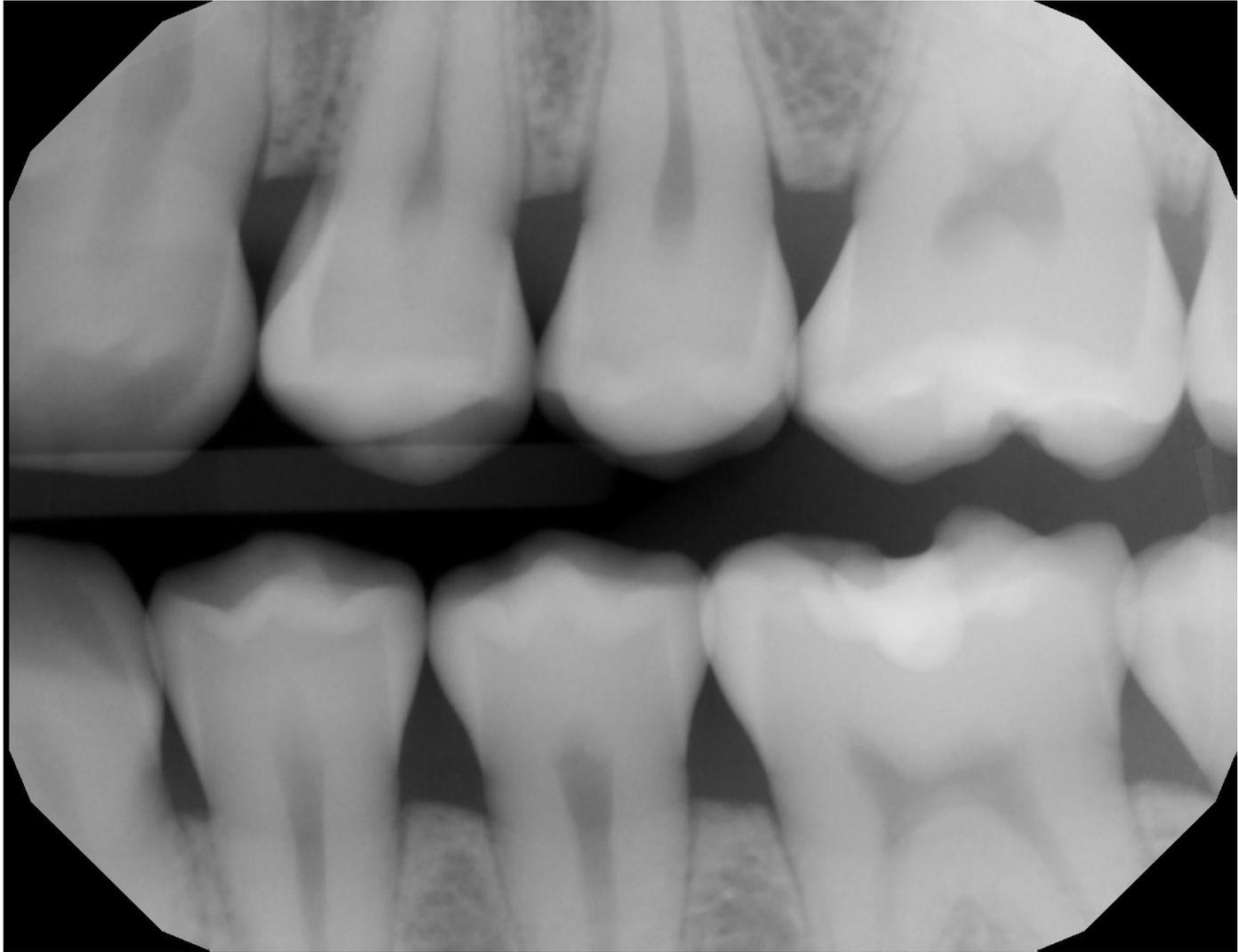


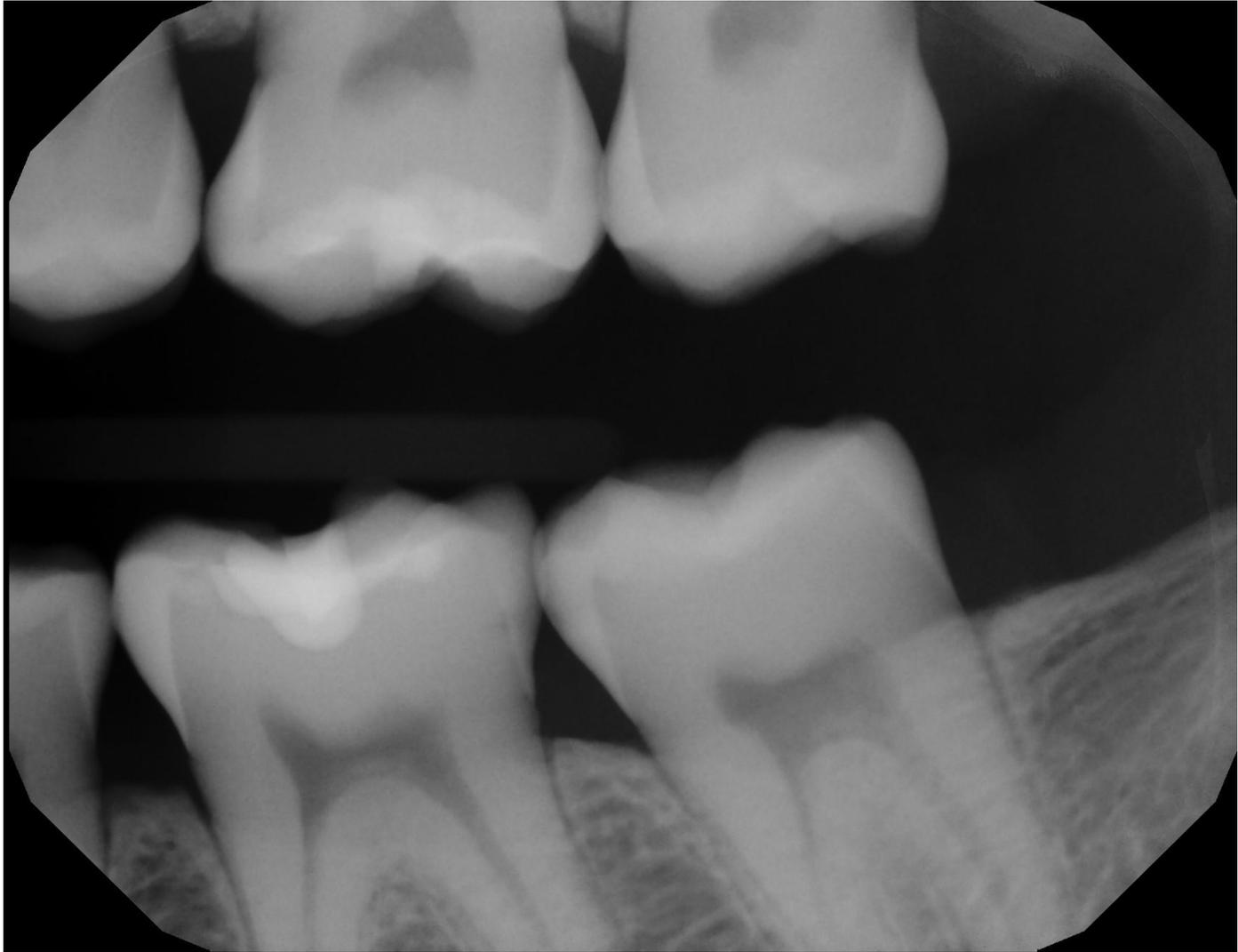
Could this have been diagnosed sooner?



Why 'watch and wait'??!!

What possible interventions?





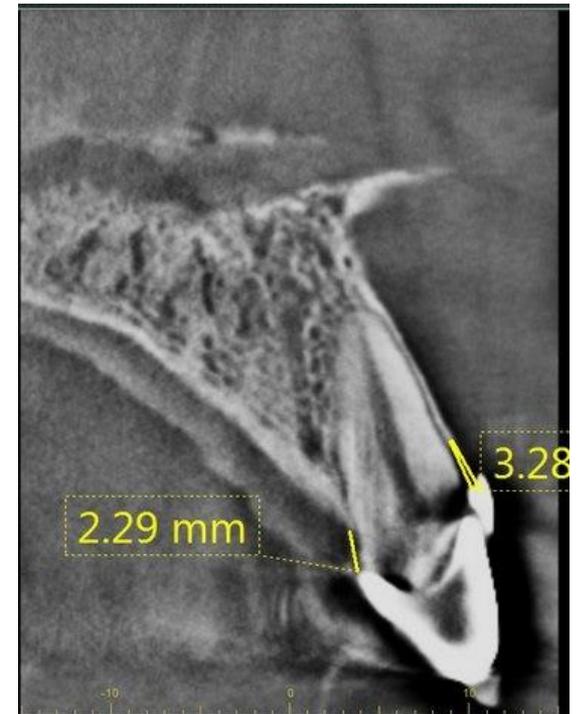
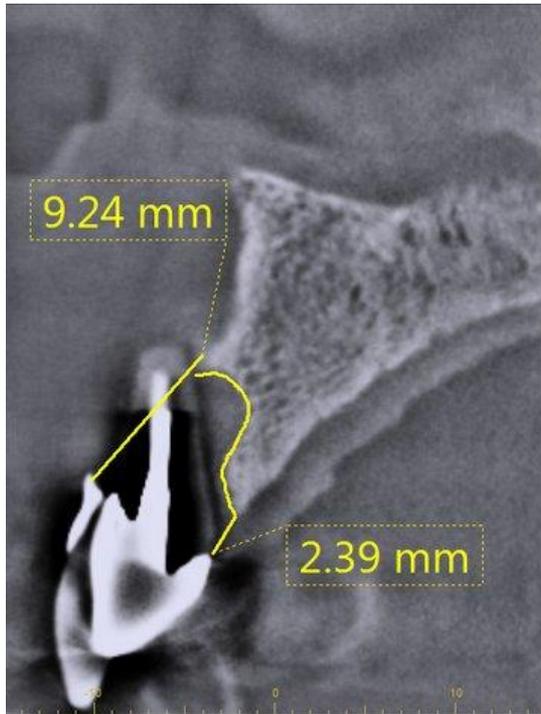




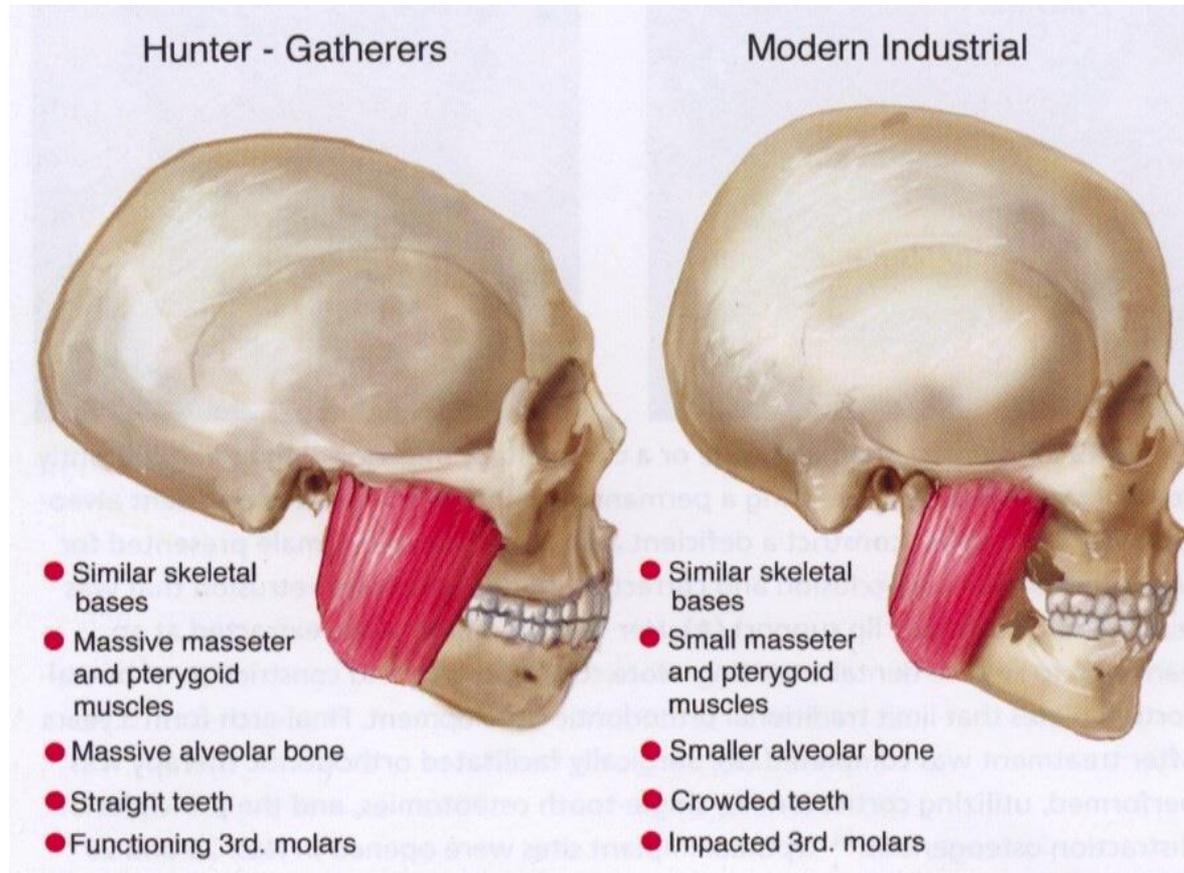


# Why 3D?

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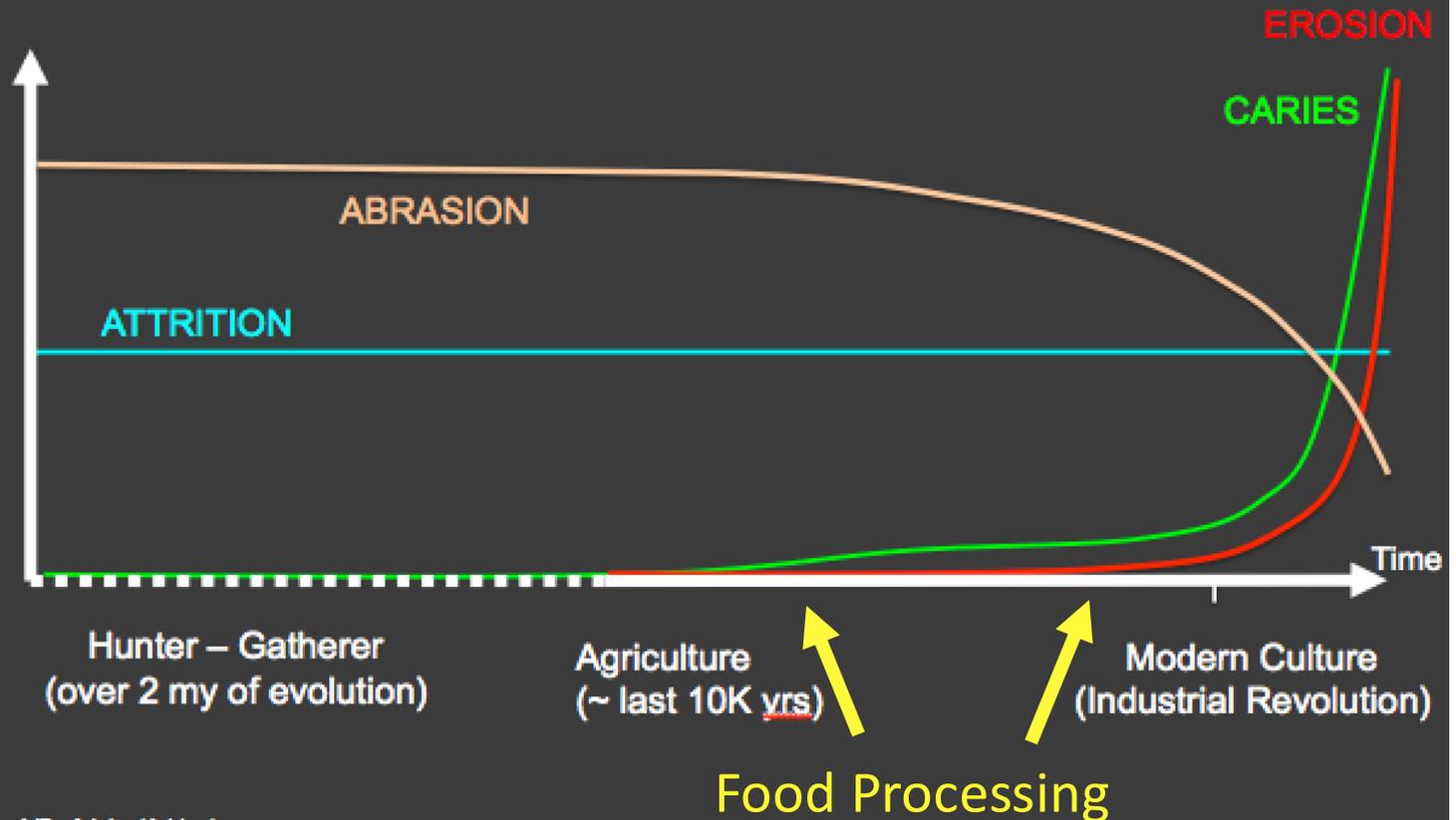


Humans: pre-historic → hunter-gatherers → agriculturalists  
→ industrial revolution → today



Airway problems

# General Population Comparisons (Abrasion, Attrition, Caries & Erosion)



A/Prof John Kaidonis  
School of Dentistry  
The University of Adelaide

Why is it important to Dx ETW?

5. It may be a sign of a serious medical or psychological problem such as GERD, OSA or Bulimia







2007



2015



Erosion related to gastric reflux (GERD)

Can you tell on which side the patient sleeps?

# Minimally Invasive Care in Oral Health

## Dental and Medical Billing Codes



The American Dental Association and American Medical Association have embraced these new technologies and created billing codes to facilitate provider adoption and reimbursement.

## Dental Codes (CDT)

**D2991** Application of hydroxyapatite regeneration medicament. [NEW in 2024, learn more.](#)

**D1354** [Silver diamine fluoride](#) (SDF) treatment.

**D1355** Alternative to sealants for site specific prevention.

**D1999** Unspecified preventive procedure.

**D4381** Localized delivery of antimicrobial agents.

## Medical Codes (CPT)

**X115T** Application of silver diamine fluoride (SDF) by a physician or other qualified health care professional. [NEW in 2023, learn more.](#)

**0792T** Silver diamine fluoride for dental caries.

**99188** Application of topical fluoride varnish by a physician or other qualified health care professional.

# MANAGEMENT STRATEGIES

- \* Observe and wait
- \* Behavioral modification
- \* Apply fluoride
- \* Use sealant
- \* Restore



# Recaldent casein phosphopeptides & amorphous Ca phosphate

## FLUORIDE VARNISHES: SIDE-BY-SIDE COMPARISON



When choosing a fluoride varnish, efficacy is critical, however, patient satisfaction is also very important when it comes to flavor and color. A fluoride varnish is applied on the tooth surface and your patients do not want to leave the office with a yellow-ish brown tint on their teeth.

The color of the fluoride varnish should blend in easily on the tooth when applied. A white, natural coloring increases the acceptance of the fluoride varnish treatment and opens the door for additional treatments in the future.

A fluoride varnish should be clinically transparent on the teeth. Comparison of the leading fluoride varnishes upon opening demonstrates the importance of color and a patient friendly reaction.



### MI Varnish

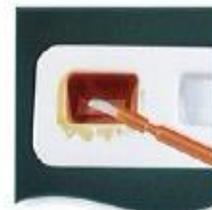
Your patients will love MI Varnish. MI Varnish flows easily. Its appealing white translucent shade *does not immediately clump* upon exposure to saliva allowing ease of use and longer working time. MI Varnish is clear when applied and flows easily into interproximal areas, due to its viscosity.



Competitor 1



Competitor 2



Competitor 3



Competitor 4

**'GC'**



# MANAGEMENT STRATEGIES

- \* Observe and wait
- \* Behavioral modification
- \* Apply fluoride
- \* Use sealant
- \* Restore



# Treatment

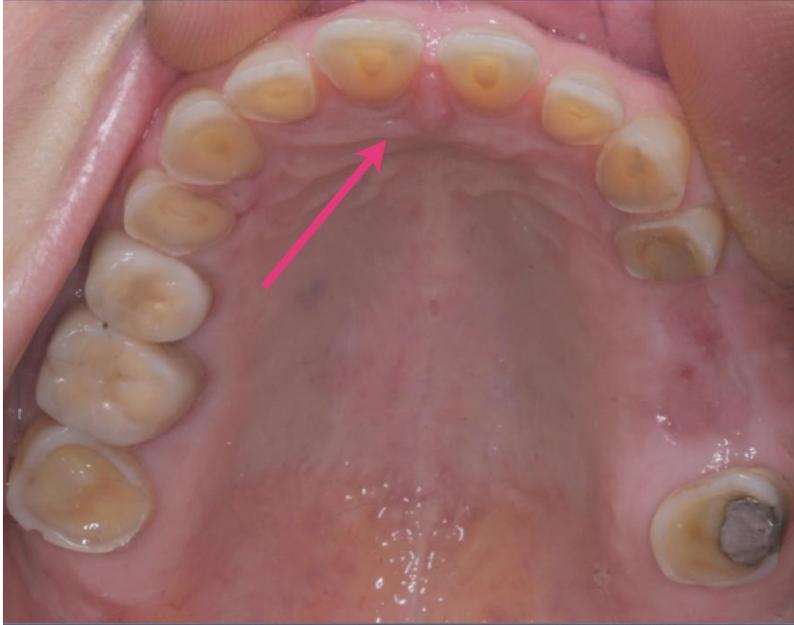
## Conservative Restorative Care

### Early intervention

- Sealants and flowable composites
  - 84% present after 5 years Kuhnisch J. Dent
  - Mat. 2012;28:298-303



Why don't we have any caries?



# Occlusion may be important with the “Effects” of bruxism

Improvements in occlusion may help control the impact of bruxing (tooth fractures, mobility, hypersensitivity) and improve chewing function, but NOT help sleep bruxism.

Management of occlusion is still very important!!

Lavigne GJ et al, J Oral Rehab. 2008;35:476-494

# Management of tooth wear: Early Detection Vs. Extensive Treatment



Treatment decisions should be based on age, severity and ability to modify etiologic factors.

# MINIMALLY INVASIVE DENTISTRY

“The goal of dentistry is to make patients worse at the slowest possible rate.”

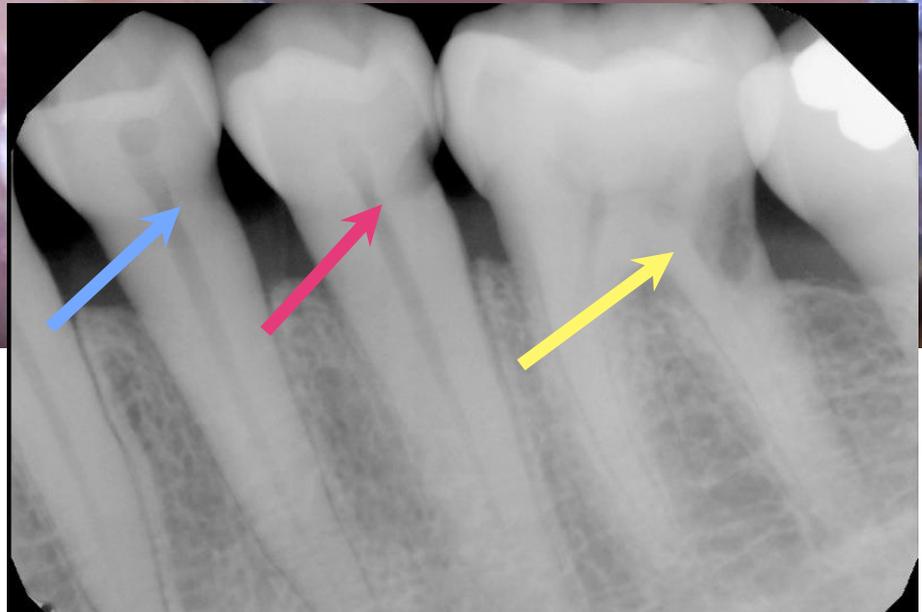
Robert Barkley

MID is about trying to save teeth long term!





Caries? NCCL?





**MUST EMBRACE NEW PHILOSOPHIES**

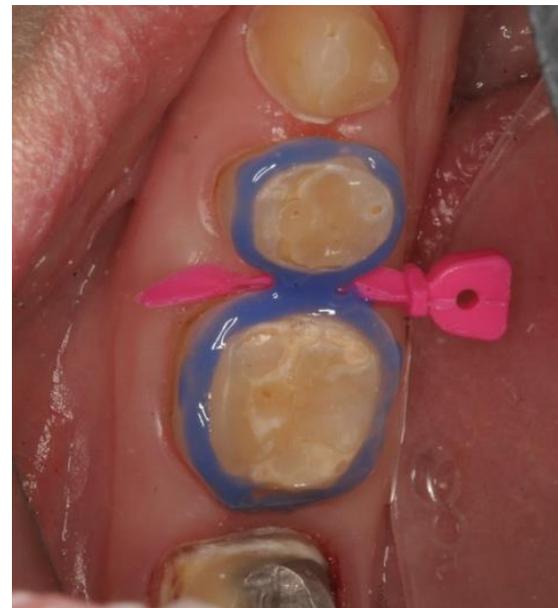


Consider how the concept of 'supragingival dentistry' could simplify your practice....

- \* No cord packing or soft tissue problems
- \* Less time spent prepping
- \* Higher impression success - with or without digital
- \* Less tooth removal and less sensitivity
- \* Relies on bonded restorations, thus less retention
- \* Overall, less invasive and more conservative

...longterm success is mainly related to ability to bond to enamel =

**“ENAMEL IS KING!!”**



Adhesively-bonded, minimally-invasive, all-ceramic or composite restorations.





## The take-home lesson

Think in terms of tooth wear (tooth structure loss), and not just in terms of “bruxism”.

This ‘world view’ will open up many new possibilities for management and treatment of erosive tooth wear problems



[wnoble@pacific.edu](mailto:wnoble@pacific.edu)

There is always a multifactorial cause of tooth wear.



# TREATMENT

Rehabilitation, if Needed



What Would You Do?

# Before and After



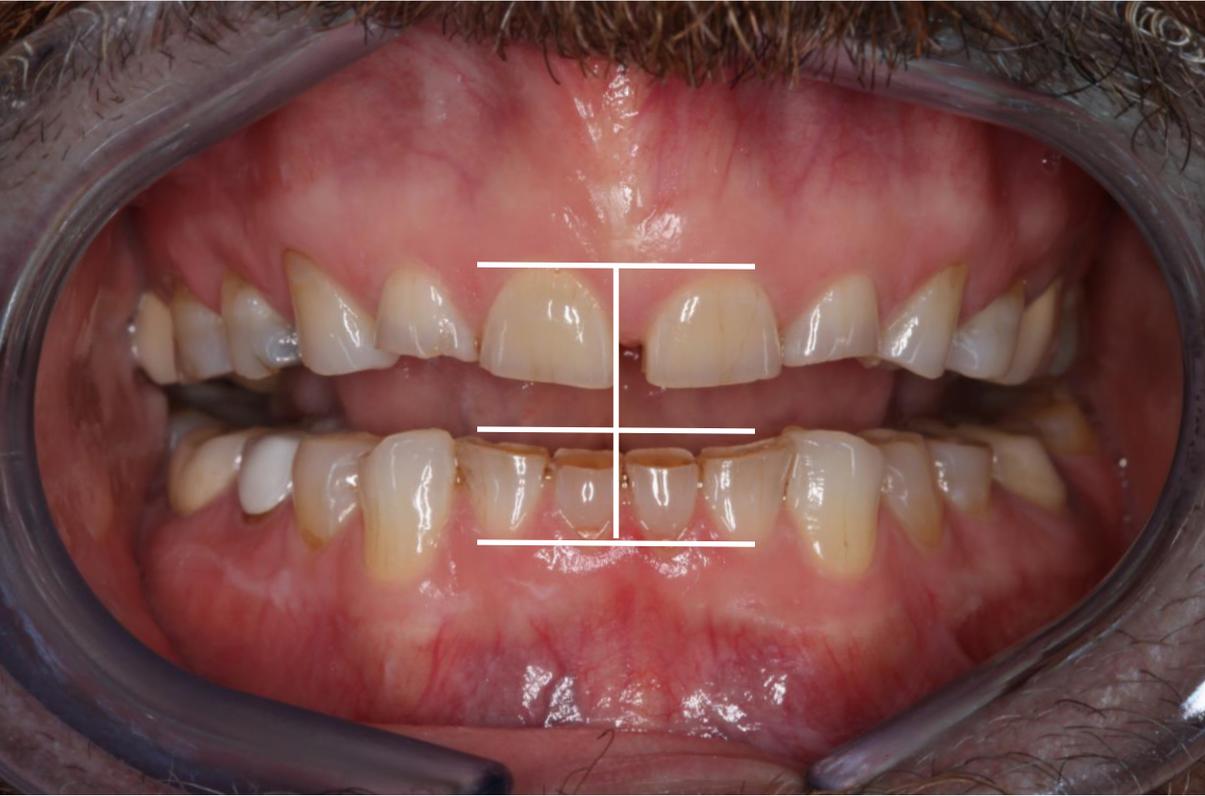
# Our Next Patient

- **Clinical Condition:** Worn dentition, diagnosed with severe
  - sleep apnea and GERD. Loss of vertical dimension
- **Treatment Plan:** Fifth opinion on a full mouth reconstruction
  - 
  - 
  -
- **Desires:** Wants problem fixed.

# Some Key References



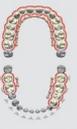




3s

Navigation: Back, Preview, Next

### Anatomy Design



- Connectors
- Sculpt anatomy
- Sculpt denture base
- Coupling mechanism
- Pre-manufacturing

### Manufacturing Settings

Assembling type: Base with designed teeth

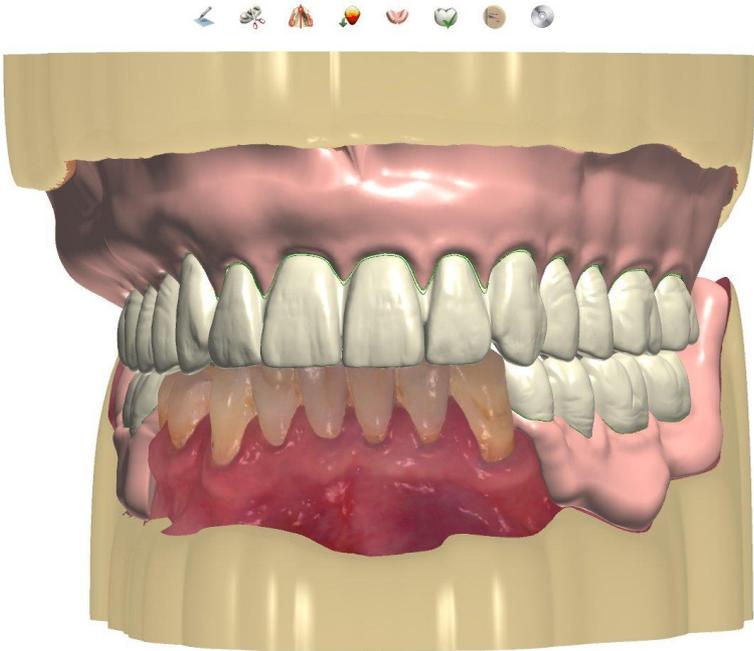
Min. thickness under teeth: 0.80 mm

Parameters of pockets

Drill compensation:

Drill radius: 0.60 mm

Glue space: 0.20 mm



# Before and After



# Before and After Mandibular Arch



# Before and After Maxillary Arch



# Before and After



Look what happens when you cut down too many trees...



Questions?



## Why this topic

- ADA
- Sleep Facts
- Co-morbidities
- GP Effect
- ADHD
- Bruxism
- Wear/Acid
- Saliva
- Treatment





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**LOONEY TUNES**

