Life is a breeze........ except when you’re dry as a bone

Complicated, real life situations

Spotlight on Sjogren’s syndrome – primary

- dry mouth
- 2012 – nearly 6 years
- 2016 – down to 3
- antibodies
- 2017 – target 2.5
- 4 million Americans

Saliva and tears

- inflamed lacrimal glands
- body destroys glands
- lack of flow
- poor quality

Demographics

- 90% female
- age 40 approx - menopause
- 10% male – 10%
- under and undiagnosed
- children – not common
- enlarged parotid gland

Ocular symptoms

- abraded cornea
- infections
- discomfort
- blurry vision
- stuck eye lids

Impact

- quality of life
- financial
- emotional
- 5+ health care providers

Testing oral pH

Improving the patient’s outcome

- Individual clinical expertise
- Best external evidence
- EBM
- Patient values & expectations

http://med.fsu.edu/index.cfm?page=medicalinformatics.ebmTutorial
Complex patients - complex solutions

Complicated, real life situations

Who has the highest risk?

- 70 year old female
- severe polypharmacy-induced xerostomia
- high caries risk
- every 3 months - something new
- extremely sensitive tissues
- has had severe mucositis to everything I have recommended for use in her custom fl trays

Challenges

- life style
- self care
- dry mouth
- compliance

Medically complex

- challenged immune systems
- chronic health issues

Dry mouth

Prevalence and clinical presentation

Multiple terms - quality of life

- dry mouth / syndrome
- hypo-salivation
- xerostomia

Hyposalivation

- clinical diagnosis
- decreased salivary flow
- insufficient in saliva

Xerostomia

- subjective term
- perceived lack of moisture
- changes in composition


Prevalence

- 30% population
- more women
- 10% early 30s
- over age 50

Insufficient flow

- subtle changes
- 50% decrease - noticeable
- pH decreases
- increased demineralization

Visual observations

- red, glossy, parched
- pebbled tongue
- cracking in commissures
- chapped lips
- thick, foamy, ropy saliva

Clinical complaints

- sore mucosa
- burning sensation
- stickiness
- halitosis
- metallic taste

Additional complaints

- difficulty talking
- taste alterations
- dry/sore throat
- metal taste
- problems chewing
- difficulty swallowing
- dential hypersensitivity

Dry mouth (Xerostomia): Diagnosis, Causes, Complications and Treatment. Dental Professional Version. Delta Dental. 2011

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**Saliva functions and benefits**

- **Digestion**
  - chewing
  - bolus
  - swallowing
  - enzymes
  - taste

- **Protection**
  - dilution
  - lubrication
  - cleansing
  - increase pH
  - buffering-neutrallizes
  - remineralization
  - anti-microbial
  - healing
  - social interaction
  - excretion

- **Additional functions**
  - speech
  - nutrition
  - kissing
  - licking
  - kissing
  - excretion

- **Sources**
  - 90% - whole saliva
  - parotid - 30%
  - sub-mandibular - 60%
  - sub-lingual - 5%
  - 10% - minor glands - 5%

**The kiss**

- longest - 58 hours, 35 minutes and 58 sec
- lowers cortisol levels
- heart beats faster
- more oxygen reaches your brain

**Saliva - production, composition, flow**

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*The kiss and the Control of Its Functions. Ekberg (ed.), Dysphagia, Medical Radiology. Diagnostic Imaging, Springer-Verlag Berlin Heidelberg 2012*
Healthy saliva – composition

- 99% water
- also contains
  - proteins
  - enzymes
  - mucins
  - buffering compounds

Secretions serous and mucous

- parotid - serous and enzymes
- submandibular - 90% serous, 10% mucous
- sublingual and minor - 80% daily mucous

Mucins - wetness and comfort
proteins with carbohydrate chains

- lubricates
- controls viscosity / elasticity
- affects stickiness
- saliva contact with oral cavity

Proline-rich proteins and arginine

- PRPs - 70% of all salivary proteins
- formation / function acquired pellicle
- arginine - ammonia production
- buffering compounds

Healthy - daily flow rate

- 0.5 to 1.5 liters
- resting - 0.25 to 0.4 /min
- stimulated - 1 - 3 ml / min
- establish a baseline!

Flow rate - visual inspection

- retract lower lip
- dry with gauze
- 1 min - drops on mucosa
- sufficient flow - pooling in floor of mouth

Testing flow rate / per min

- chew wax - 5 min
- spit in cup
  - normal - 1 to 3ml
  - low - 0.7 to 1 ml
  - very low - < 0.7 ml
**Stimulated saliva**
- 80 - 90% daily salivary production
  - anticipatory tongue/lip movements
  - chewing
  - taste
  - smell


**Critical pH**
- critical pH – is a dynamic number
- dependent - salivary calcium and phosphorus
- average resting salivary pH 6.4 – 7.


**Quality of life**
- resting - pH 6.8 - 7.2
- favors homeostasis
- supports remineralization
- suppresses pathogens


**Saliva – Fast facts...**
- peak flow - late afternoon
- during sleep - near zero flow
- acid substances - salivary flow rates
- parotid gland – 50% of stimulated saliva


**Healthy salivary pH**
- resting - pH 6.8 - 7.2
- favors homeostasis
- supports remineralization
- suppresses pathogens


**Tasting**
- Sweet
- Sour
- Salt
- Bitter
- Umami

Source: Neuroscience made understandable | Alexander van Aken | Brighton and Sussex Medical School - 2014 © 2019
Tongue papillae
- 1 - 200 tastebuds per papillae
- taste pores house taste cells
- 50-150 taste receptor cells per taste bud

Taste buds
- sensitive to - sweet, bitter, salt, or sour
- taste buds - taste pores
- chemicals in solution - stimulate receptor cells

Tasting food
- saliva initiates taste
- poor taste - anorexia
- adequate nutrition
- supports muscle mass
- immune system

Taste disturbances
- ageusia - complete lack of taste
- hypogeusia - decrease taste sensitivity
- dysgeusia - metallic/foul/rancid/salty
- phantoguesia - phantom taste
- cacogeusia - revolting taste

Compromises
- food sticks to teeth
- raw food - hard to chew
- increase sticky, processed foods

Compromises
- sip on sweet drinks
- require no chewing / preparation
- high carb nutritional supplements

Liquid intake challenges

What Does Water do for You?
- Helps dilutes existing saliva
- frequent bathroom breaks
- disturbed sleep

Compromises
- high fluid intake
- often sweet

**Medical conditions**

- Sjögren syndrome - primary
- Hashimoto's disease - thyroid
- rheumatoid arthritis
- secondary SS - other autoimmune disorders

**Medical conditions**

- diabetes
- endocrine disorders
- Parkinson's disease
- pregnancy - nursing
- chronic fatigue syndrome

**Medical conditions**

- HIV / AIDS
- eating disorders
- laxative abuse
- hepatitis C
- Alzheimers
- genetic disorders

**Medical conditions - complication**

- intestinal failure
- COPD
- anxiety
- depression
- cancer therapy
- liver transplant

**Pathology and sequela**

- salivary gland disfunction
- removal salivary glands
- end of life / terminal illness
- menopause

**Treatments**

- hemodialysis
- radiation treatment
- hormone imbalance
Medications - OTC and Rx

- HBP
- nausea
- anxiety
- depression
- pain
- appetite control
- seasonal allergies

Conditions - lead to dehydration

- fever
- vomiting
- excessive sweating
- diarrhea
- blood loss
- burns

Respiratory

- seasonal allergies
- facial anatomy
- dust / wind
- nasal congestion
- asthma
- sleep apnea
- mouth breathing
- coughing

Oral appliances

- dentures / partial dentures
- bite guards
- orthodontic aligners
- sports mouth guards
- whitening trays

Lifestyle

- smoking / vaping
- recreational drugs
- C-Pap machine
- prolonged speaking / singing
- stress
- anxiety/fear
- caffeine
- alcohol
- heavy exercise

Climate

- air conditioning
- central heat
- desert climates
- cold temperatures
- airplanes / hotel rooms
Smoking prevalence by state

Smoking statistics - USA

17.8% (42.1 million) Americans
20.5% of men
15.3% of women

Lifestyle - sodium intake

26.1% 26.8% 19.4% 20.6% 12.5% 17.4%
2013 data

Lifestyle - diet

94% from food!

★ high sodium intake
★ processed foods

Understand sodium intake levels

I love you, salt, but you’re breaking my heart.
Take the Pledge

Gateway - the rest of the body

oral disease is complex
changing hormone levels
medications causing dry mouth
 genetics
immune system
lifestyle / environmental factors
natural aging process

Erosion

progressive loss of hard tissue
chemical loss - not bacterial
most important factor - hypersensitivity
erosive lesions - generally sensitivity

How does erosion happen?
Erosion - a multifactorial condition

Erosion vs. caries

- surface-softening lesion
- non-bacterial - extrinsic and intrinsic acids
- complicated by attrition and abrasion
- remineralization difficult
- prevalence - increases with age

Sensitivity and fungal infections

Dentinal hypersensitivity

- common
- transient pain
- short, sharp sensations
- exogenous stimuli

Two conditions are necessary

- exposed dentin via loss of enamel or periodontal tissues
- open dentin tubules - patent to the pulp – loss of smear layer

Structural differences between sensitive and non-sensitive dentin*

- No of open tubules: 8 x vs. x
- Diameter of tubules: 0.83 vs. 0.43
- Fluid Flow (Poisseuille’s law): 16 y vs. y

Hidden hypersensitivity

Stimulus

- thermal stimulus (cold) 75%
- tactile stimulus 25%
- osmotic stimulus (sweet) 16%
- air blast 16%

Rule out other conditions

- occlusal trauma
- cracked tooth syndrome
- caries – new and recurrent
- pulpal pathology
- gingival sensitivity
- layered sensitivities

Redheads

- high anxiety
- fear of pain
- avoid dental care
- more sensitive to cold
- subcutaneous lidocaine significantly less effective

Candidiasis

- tongue
- commissures
- buccal mucosa
- palate

Solutions

- stimulate saliva
- raise pH
- balance components
- limit fermentable CHO intake

Improving saliva and neutralizing acids

- non-fermentable sweeteners
- metabolic inhibitors - fluoride
- anti-adhesion - xylitol
- arginine products

Conversation starters!
oral health to general health

★ get the facts
★ coaching not scolding
★ develop positive energy
★ create a legitimate spin

Conversation starters!

★ health benefits
★ save money, time, comfort
★ offer alternatives
The magic of xylitol!

- interferes with Strep Mutans metabolism
- disrupts biofilm integrity
- promotes neutral pH
- stimulates salivary flow

Can be fatal to dogs and ferrets
Avoid fructose for up to one hour after use

Using xylitol
- one of first three ingredients
- gum/candy - four times a day for 3-5 minutes
- 4 - 10 grams per day
- tooth paste, wipes, pacifier, mouth rinse, spray, gel
- excessive use – laxative effect

Xylitol products

Washington state xylitol innovations!

- slow release
- adhesive back
- stick and stay

Xerostom Dry Mouth System

- olive oil
- betaine
- xylitol
- fluoride
- calcium
- potassium

Up to 200% increase in unstimulated salivary flow

Biotene Rinse

- 5.39 pH - acidic!
- 6.11 pH
- 6.61 pH

Rinse or spray
- chitosan derivatives
- arginine
- betaine - humectant
- xylitol
- spearmint flavor

Relieves symptoms
100% increase - unstimulated/resting saliva
23.8% increase - stimulated saliva

New! Hydrius Dry Mouth System

- soothing locks in moisture
- low impact flavor
- plant-based ingredients
- coconut oil
- sodium fluoride
- no alcohol

Cleared by the FDA as a Medical Device: To relieve the symptoms of dry mouth.
Water, xylitol, hyaluronan, sodium benzoate, and potassium sorbate

Lubricity

Moisture Pearls

Lipid-based solution

- limit water loss
- moisten
- lubricate
- not acidic

Adheres to oral mucosa
Form protective film
Rx spray lasts up to 4 hours


Improvements in:
- chewing
- tasting
- swallowing
- speaking

92% improved symptoms
84% improved quality of life

Saliva support

Click Here to receive FREE Samples for your Office

More solutions

What is arginine?

- natural amino acid
- naturally found in saliva
- bipolar molecule + and - charge groups
- net positive charge

Arginine - mode of action

Urea - few bacteria
- saliva & crevicular fluid
- broken down by urea
- byproduct - ammonia

Arginine - many bacteria
- low in saliva/abundant in peptides
- ADS - 3 enzyme system
- byproduct - ammonia
- action produces ATP

Arginine +
Arginine - mode of action

- exogenous source of arginine - toothpaste
- enhances alkaline pH in saliva and plaque
- 4 weeks - arginine toothpaste
- alkali production higher - plaque samples caries active (CA) subjects
- CA subjects - shift in bacterial composition - healthier


© 2019

Arginine bicarbonate calcium carbonate tooth paste - lower DMFS

- 6,000 children - low to moderate risk - 6-12 years old
- double blind, randomized - 3 groups - 2 year study
- 1,450 ppm Fl paste
- 1,450 Fl + 1.5% arginine/calcium carbonate or dicalcium phosphate
- 16.5% lower DMFS - arginine/calcium/flouride groups than Fl paste alone


© 2019

- inhibits bacterial adhesion - tooth surfaces
- reduces biofilm thickness
- reduces EPS matrix density
- arginine + fluoride - suppresses S. mutans and P. gingivalis
- suppresses C. albicans growth
- facilitates microbial resistance - acidic environment


© 2019

Arginine bicarbonate calcium carbonate - keeping saliva neutral

Stoney Brook University School of Dental Medicine - Spring 2014

Arginine-based products

Remineralization strategies

Tubule occlusion

Stannous fluoride
- toothpaste, gel, rinse
- varnish, gels

High fluoride
- varnish, gels

Precipitating salts
- calcium phosphate
- arginine bicarbonate

Restorative materials
- adhesives
- silicates
- resins
- hydroxyapatite

Laser
- soft laser

ACP - Amorphous calcium phosphate
- releases calcium and phosphorus
- highly soluble compound - prolonged substantivity?
- building block of apatite

CPP-ACP compounds
- contains casein phosphopeptide (Recaldent)
- adheres to soft tissue, plaque, teeth
- calcium and phosphate - released during acid challenge
- contraindicated with milk allergy

Tricalcium phosphate action

- moisture breaks down barrier
- fluoride, calcium, phosphate - readily available
- creates fluorapatite

© 2019 Hydrogen Peroxide

‣ antiseptic
‣ debridement
‣ reduces inflammation

- naturally occurs - breast milk, saliva, liver
- no allergic reactions
- no known bacterial resistance

Hydrogen Peroxide concentrations –≤3%

Effect on biofilm
- degrades EPS - slime
- lyses bacterial cell walls
- oxygen - death to anaerobes

Approved for oral use by FDA

- breaks down protein chains
- softens hard deposits


Hydrogen peroxide - comparison

- 3% liquid
- pH 3
- rapid spike - bubbling

- 1.7% gel
- pH 5.5 - 5.8
- 15 min active time

Prescription trays

Problem: “Therapeutic delivery of H₂O₂ to prevent periodontal disease required mechanical access to subgingival pockets.”

- trays create hydraulic seal
- eliminates dilution
- up to 9mm
- 10 min therapeutic
- 15 min full O₂ release

1.7% peroxide gel - S. mutans biofilm

- S. mutans aerobic - will not die in oxygen
- thick biofilm mass
- live/dead dye: intact cell walls - green
degraded, lysed wall - red

Prescription tray therapy

- tray delivery - 4/2016
- only PerioGel
- twice daily - 15 min

- 3 times a day
- 15 min per session
- 1-2mm probing reduction

- PerioGel only

Photos courtesy of Bruce Cochrane, DDS - Fort Dodge IA © 2019
Prescription trays - implant

August 2007
May 2009
May 2012

- suppuration - 2yrs after placement
- initial - metronidazole, ozone therapy, mechanical debridement and irrigation - no results
- Prescription tray - started June 2009 - PerioGel plus doxycycline
- 2012 - no suppuration - bone height - two thread gain

Photos courtesy of Greg Sawyer, DDS - Los Gatos, CA

Silver diamine fluoride 38%

- natural antibacterial
- hypersensitivity relief
- carious dentin lesion turns black
- no anesthesia

2012 - no suppuration - bone height - two thread gain

Silver diamine fluoride 38%

- arrests caries
- less than $1 / 1-2 teeth
- 8ml bottle
- anyone who can apply fluoride

Dr. Bill Costerton - Founding Director      USC Center for Biofilms

3 seconds exposure
99.9% removal

"The results were almost impossible for me to believe the first time through," commented. "One of the difficulties with plaque biofilm is that you really can’t see it, it’s clear. So we didn’t have visual evidence of complete removal. But now with these direct methods, the scanning electron microscopy, you apply the Waterpik to plaque on a surface of a tooth and you look with a scanning scope and it’s gone. It’s simply gone. And that’s unequivocal and unarguable."

Dr. Bill Costerton - Founding Director      USC Center for Biofilms

Tongue

Getting national press
Tongue cleaners

- daily
- effective
- manual
- mechanical

Supportive strategies—Slowing down erosion

Summary – factors that affect erosion

✓ chemical - F1 level, pH, titratable acidity, calcium & phosphorus
✓ biological - saliva composition, flow, buffering capacity,
✓ pellicle formation and tooth composition
✓ behavioral - drinking habits, frequency, duration, timing of exposure

What is the take home message?

‣ dietary intake / patterns
‣ saliva composition / bacterial risk
‣ intervention and remineralization
‣ every patient is unique

What do we owe our patients?

‣ current, in-depth health hx
‣ assess total needs
‣ tell the truth
‣ provide all options

What do we owe our patients?

‣ current scientific information
‣ patients must make the final choice

How would you treat your Mom?

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