Conversation starters!
oral health to general health

★ get the facts
★ develop positive energy
★ create a legitimate spin
★ focus on health benefits
★ discuss savings - money, time, comfort
★ offer reasonable alternatives
★ coaching not scolding
Erosion – a multifactorial condition

Lussi A, Schlueter N, Rakhmatullina E, Ganss C. Dental erosion—an overview with emphasis on chemical and histopathological aspects. Caries Res. 2011;45.
Tooth wear – erosion

- progressive loss of hard dental tissue
- *chemical processes not involving bacterial action*
- most important factor in hypersensitivity
- erosive lesions – most likely to be sensitive


Erosion – surface softening

- citric acid pH 2.3
- 6 X 5 min/day
- 10 days
- stored in salt solution

**Figure 1-5:** Representation of the time-dependent and acid-induced process of human dental erosion: Step I softening of human dental enamel and step II loss of enamel material (according to [45])

When do teeth melt???

- critical pH – is a dynamic number
- dependent on salivary calcium and phosphorus
- average resting salivary pH 6.4 – 7.2
- root structure - pH 6
- enamel - between pH 5 and 5.5
- fluorapatite - pH 4.5

Mount GJ and Hume WJ. Preservation and restoration of tooth structure. Knowledge books and software. 2nd Edition. 2005

Dawes C. What is the critical pH and why does tooth dissolve in acid? J Can Dent Assoc 2003; 69(11):722–4

Stookey GK. The effect of saliva on dental caries. JADA 2008 May; 139;11S-17S.

Erosion –
Intrinsic factors

Regurgitation
- reflux
- bulimia
- chemotherapy
- pregnancy
- alcoholism
- peptic ulcers
- gastritis
- drug side effects

OTC supplements
medications
- chewable vitamin C
- cough drops
- fizzy liquid medications

Erosion – complicating medical conditions

GERD – gastric esophageal reflux
- 7% adults experience daily episodes
- 36% monthly
- children also experience GERD

Anorexia
- 47% are in binge/purging subcategory
- refusal to maintain normal weight

Bulimia
- Typically normal weight
- Self induced vomiting after consuming food

Erosion – Dietary intake

- acidic foods – pickles, vinegar, citrus
- carbonated beverages
- sports and energy drinks
- flavored waters
- wine – particularly dry varieties
- beer
Soda Pop!

1950s - 6.5 oz bottle

Today........
12 oz can is standard
20 oz bottle common

- Missouri Dental Association
- Brochure revised 2006
- 573-634-3436
- www.modental.org

<table>
<thead>
<tr>
<th></th>
<th>pH (acid) Level*</th>
<th>Sugar Amount** (Par 12-ounce serving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure Water</td>
<td>7.00 (Neutral)</td>
<td>0.0</td>
</tr>
<tr>
<td>Coffee (Average, Black)</td>
<td>5.00</td>
<td>0.0</td>
</tr>
<tr>
<td>Barq’s Root Beer</td>
<td>4.61</td>
<td>10.71 tsp.</td>
</tr>
<tr>
<td>Diet Dr. Pepper</td>
<td>3.41</td>
<td>0.0</td>
</tr>
<tr>
<td>Juicy-Juice (Berry)</td>
<td>3.40</td>
<td>9.75 tsp.</td>
</tr>
<tr>
<td>Fresca</td>
<td>3.20</td>
<td>0.0</td>
</tr>
<tr>
<td>Diet Sprite</td>
<td>3.17</td>
<td>0.0</td>
</tr>
<tr>
<td>Red Bull Energy Drink</td>
<td>3.10</td>
<td>9.29 tsp.</td>
</tr>
<tr>
<td>Nesta</td>
<td>3.04</td>
<td>6.07 tsp.</td>
</tr>
<tr>
<td>Propel (Berry)</td>
<td>3.02</td>
<td>0.71 tsp.</td>
</tr>
<tr>
<td>Diet Mountain Dew</td>
<td>2.96</td>
<td>0.0</td>
</tr>
<tr>
<td>Dr. Pepper</td>
<td>2.92</td>
<td>9.64 tsp.</td>
</tr>
<tr>
<td>Sprite</td>
<td>2.90</td>
<td>9.29 tsp.</td>
</tr>
<tr>
<td>Gatorade (Lemon-Lime)</td>
<td>2.83</td>
<td>5 tsp.</td>
</tr>
<tr>
<td>Mountain Dew</td>
<td>2.80</td>
<td>11.07 tsp.</td>
</tr>
<tr>
<td>Minute Maid Orange Soda</td>
<td>2.80</td>
<td>11.2 tsp.</td>
</tr>
<tr>
<td>Diet Pepsi</td>
<td>2.77</td>
<td>0.0</td>
</tr>
<tr>
<td>Diet Coke</td>
<td>2.70</td>
<td>0.0</td>
</tr>
<tr>
<td>Powerade</td>
<td>2.63</td>
<td>5.36 tsp.</td>
</tr>
<tr>
<td>Pepsi</td>
<td>2.43</td>
<td>9.64 tsp.</td>
</tr>
<tr>
<td>Coca-Cola</td>
<td>2.30</td>
<td>9.64 tsp.</td>
</tr>
<tr>
<td>Battery Acid (Yikes!)</td>
<td>1.00</td>
<td>0.0</td>
</tr>
</tbody>
</table>

# 2004 Landmark study


## Table. Beverages utilized in this study.

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Container</th>
<th>pH</th>
<th>14-day weight loss (%)</th>
<th>14-day weight loss (mg/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coca-Cola</td>
<td>Bottle</td>
<td>2.48</td>
<td>1.39 ± 0.34</td>
<td>2.78 ± 0.71</td>
</tr>
<tr>
<td>Diet Coca-Cola</td>
<td>Bottle</td>
<td>3.22</td>
<td>1.49 ± 0.29</td>
<td>3.07 ± 0.06</td>
</tr>
<tr>
<td>Pepsi-Cola</td>
<td>Can</td>
<td>2.46</td>
<td>1.40 ± 0.22</td>
<td>3.31 ± 0.43</td>
</tr>
<tr>
<td>Diet Pepsi-Cola</td>
<td>Can</td>
<td>2.94</td>
<td>1.46 ± 0.23</td>
<td>3.22 ± 0.26</td>
</tr>
<tr>
<td>Dr. Pepper</td>
<td>Bottle</td>
<td>2.90</td>
<td>1.72 ± 0.36</td>
<td>3.21 ± 0.24</td>
</tr>
<tr>
<td>Diet Dr. Pepper</td>
<td>Bottle</td>
<td>2.99</td>
<td>1.52 ± 1.00</td>
<td>2.99 ± 1.24</td>
</tr>
<tr>
<td>Mountain Dew</td>
<td>Bottle</td>
<td>3.14</td>
<td>6.17 ± 1.13</td>
<td>14.31 ± 0.94</td>
</tr>
<tr>
<td>Diet Mountain Dew</td>
<td>Bottle</td>
<td>3.27</td>
<td>8.01 ± 1.46</td>
<td>14.82 ± 2.23</td>
</tr>
<tr>
<td>Sprite</td>
<td>Can</td>
<td>3.27</td>
<td>3.93 ± 1.30</td>
<td>8.60 ± 1.94</td>
</tr>
<tr>
<td>Diet Sprite</td>
<td>Can</td>
<td>3.34</td>
<td>3.65 ± 1.27</td>
<td>6.43 ± 0.37</td>
</tr>
<tr>
<td>Canada Dry ginger ale</td>
<td>Can</td>
<td>2.94</td>
<td>3.48 ± 0.71</td>
<td>6.31 ± 0.65</td>
</tr>
<tr>
<td>A&amp;W root beer</td>
<td>Can</td>
<td>4.80</td>
<td>−0.01 ± 0.12</td>
<td>−0.03 ± 0.28</td>
</tr>
<tr>
<td>Arizona iced tea</td>
<td>Can</td>
<td>2.94</td>
<td>4.86 ± 0.59</td>
<td>9.03 ± 1.21</td>
</tr>
<tr>
<td>Brewed black tea</td>
<td>N/A</td>
<td>5.36</td>
<td>0.22 ± 0.07</td>
<td>0.35 ± 0.12</td>
</tr>
<tr>
<td>Brewed black coffee</td>
<td>N/A</td>
<td>6.25</td>
<td>0.19 ± 0.03</td>
<td>0.34 ± 0.03</td>
</tr>
<tr>
<td>Tap water (control)</td>
<td>N/A</td>
<td>6.70</td>
<td>−0.02 ± 0.08</td>
<td>−0.05 ± 0.13</td>
</tr>
</tbody>
</table>
Are you sure you want to drink another soda??

Erosive potential of four soft drinks

Study drinks

✓ Red Bull
✓ Classic coke
✓ Diet coke
✓ Gatorade

Measured
✓ pH
✓ Titratable acidity
listed all ingredients found in the beverage

Chemical erosion via soft drinks

- human molars – free of decay
- imbedded in acrylic - enamel exposed
- half the surface – coated with nail polish
- remaining surface - exposed to beverage
- beverage changed daily
- 14 days = 14 years drinking exposure
- microscopic and SEM evaluations

Post immersion photos – 20x magnification

Classic Coke

Diet Coke

Post immersion photos
20x magnification

Control – Tap water

Note-Chalky, dull enamel

Gatorade

Red Bull

Total acid content of beverages

**pH-Initial acidity**
- measures hydrogen ion concentration

**TA-Titratable acidity**
- measures the total number of acid molecules / erosive potential
- higher TA = Longer time to reach neutral, safe pH value/salivary clearance

What’s different about these non-carbonated drinks?

- multiple organic acids
- added sucrose and glucose
- TA off the charts! Requires more titration
- citric acid - binds (chelates) calcium - higher pH
- net effect – accelerates calcium lost from tooth
- maintains pH below 5.5, causing erosion


USA – average annual consumption

- *average American drinks 100 gal/year* – three bath tubs full!
- teen age boys drink 160 gal/year
- *one-quarter of all drinks consumed*
- 450 different types of soda pop
- 2,500,000 vending machines in the USA

Jacobsen MF. Liquid candy – How soft drinks are harming Americans’ health. Center for Science in the Public Interest. July 2005
The beverage of choice – kids and teens

*consumption doubled in the last ten years*

**teenage boys**

3+ cans / day

10% drink 7+ cans a day

**Teenage girls**

2 cans per day

10% drink more than 5+ cans a day

Jacobsen MF. Liquid candy – How soft drinks are harming Americans’ health. Center for Science in the Public Interest. July 2005
Bottled water!!!
pH levels of 5-5.5 are common

Mouth Rinses!!!
pH levels 3.5 to 5

What a brew!

<table>
<thead>
<tr>
<th>Carbonated water</th>
<th>Sodium citrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>High fructose corn syrup</td>
<td>Gum arabic</td>
</tr>
<tr>
<td>Concentrated orange juice and other natural flavors</td>
<td>Erythorbic acid (preserves freshness)</td>
</tr>
<tr>
<td>Citric acid</td>
<td>Calcium disodium EDTA (protects flavor)</td>
</tr>
<tr>
<td>Sodium benzoate (preserves freshness)</td>
<td></td>
</tr>
<tr>
<td>Caffeine (55.2 mg/12 oz)</td>
<td>Brominated vegetable oil</td>
</tr>
<tr>
<td></td>
<td>Yellow 5</td>
</tr>
</tbody>
</table>
The scoop..... powdered drinks

- Bottled water - pH 6.3
- Propel Fit Powder 'vitamins' - raspberry lemonade flavor - pH 3.2
- Kool-Aid Singles - cherry flavor - pH 2.8
- Country Time Lemonade 'On the Go' - pH 2.5 powder
- Crystal Light 'On the Go' - raspberry ice flavor - pH 2.6
Beverage consumption
Fast Facts........

Children age 6 - 11 from 1977 - 2001

*increased*  
- 137% soda consumption
- 54% fruit juice
- 69% fruit drink

*decreased*
- 39% milk consumption

*sugar sweetened beverages - 11% total calories*

Energy drink consumption - world wide 2006–2012

http://www.foodpolitics.com/tag/energy-drinks/
Energy drinks risks

- heart palpitations
- increases blood pressure
- nausea, stomach upsets
- headaches
- psychiatric disturbances
- sleep disturbances
- tooth erosion
- weight gain
- fatigue


Energy-sports drinks – Adults  
2010 National Health Interview Survey

✓ 31.3% consumed 1 drink past 7 days
✓ 11.5% more than 3X per week
✓ age 18 -24 10x more likely to consume than those age 40+

- younger adults
- male
- current smokers
- unmarried
- higher family income
- non-Hispanic blacks & Hispanics
- live in South or West
- engaged in leisure-time physical activity
- highly satisfied with their social activities/relationships

Energy drinks - Troops

- Monster - top seller - military PX
- 44% deployed troops - one per day
- 13.9% three +/day - slept less than 4 hours a day
- Three a day - increase in sleep problems / stress / illness / day time sleepiness during guard duty or briefings


Tea - brewed teas

- citrus and fruity teas - greatest lesion depths
- pH inversely associated with depth
- titratable acidity positively associated with depth

Smoothies

- kiwi, apple and lime *most erosion depth*
- cranberry, blueberry, cherry, strawberry and banana - *reduced surface micro hardness*
- smoothie with yoghurt - no change in surface hardness
- recommend - consume during meals

Tea - ready to drink

- low pH values - all below 4.03
- high titratable acidity values
- acidulants added - typically citric acid

digestive aids / trends

- apple cider vinegar
  - 2 tsp twice daily
  - sweeten with honey
  - pH 2.8 - 3.0

- Kombucha tea fermented
  - fermented - tea + sugar + yeast + bacteria
  - contains vinegar
  - pH 2.8 - 3.2

- 24 oz warm water
- juice of 1 lemon
- pH approx. 2.4

“But drinking lemon-water does not expose the teeth for excessive amounts of time to high citrus acidic levels in the mouth, thereby causing no harm to the enamel. In fact, it improves plaque-stained teeth and bad breath.”
Marketing to children and teens

Figure II.3: Child and Teen Marketing, Ranked by Youth Expenditures

Industry growth analysis

### U.S. LIQUID REFRESHMENT BEVERAGE MARKET
CHANGE IN VOLUME BY SEGMENT
2010 – 2011

<table>
<thead>
<tr>
<th>Segments</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Drinks</td>
<td>14.4%</td>
</tr>
<tr>
<td>RTD Coffee</td>
<td>9.4%</td>
</tr>
<tr>
<td>Sports Beverages</td>
<td>8.8%</td>
</tr>
<tr>
<td>RTD Tea</td>
<td>4.8%</td>
</tr>
<tr>
<td>Bottled Water</td>
<td>4.1%</td>
</tr>
<tr>
<td>Carbonated Soft Drinks</td>
<td>-1.7%</td>
</tr>
<tr>
<td>Value-Added Water</td>
<td>-1.7%</td>
</tr>
<tr>
<td>Fruit Beverages</td>
<td>-2.1%</td>
</tr>
<tr>
<td><strong>TOTAL LRB</strong></td>
<td><strong>0.9%</strong></td>
</tr>
</tbody>
</table>

*Source: Beverage Marketing Corporation*
2013 – Brand Market Share – Energy drinks

Red Bull - $3.4 BILLION
Monster - $3.1 BILLION

### Top Selling Energy Drink Mixes

<table>
<thead>
<tr>
<th>Rank</th>
<th>2013</th>
<th>2013 sales ($millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MIO Energy</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>Crystal Light Energy</td>
<td>39.5</td>
</tr>
<tr>
<td>3</td>
<td>Private Label</td>
<td>36.7</td>
</tr>
<tr>
<td>4</td>
<td>Propel Energy Drink Mix</td>
<td>23</td>
</tr>
<tr>
<td>5</td>
<td>Zipfizz</td>
<td>12.5</td>
</tr>
<tr>
<td>6</td>
<td>4C Energy Rush</td>
<td>3.3</td>
</tr>
<tr>
<td>7</td>
<td>Ecodrink</td>
<td>1.5</td>
</tr>
<tr>
<td>8</td>
<td>Splash</td>
<td>.34</td>
</tr>
</tbody>
</table>
**pH and titratable acidity values**

<table>
<thead>
<tr>
<th>Beverages</th>
<th>Initial pH</th>
<th>Titratable acidity (amount of NaOH req) up to pH 5.5</th>
<th>Titratable acidity (amount of NaOH req) up to pH 7.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fanta</td>
<td>3.46</td>
<td>3.4 ml</td>
<td>6.8 ml</td>
</tr>
<tr>
<td>Limca</td>
<td>3.49</td>
<td>2.7 ml</td>
<td>5.7 ml</td>
</tr>
<tr>
<td>Thums up</td>
<td>3.16</td>
<td>2 ml</td>
<td>5.6 ml</td>
</tr>
<tr>
<td>Appy juice (apple)</td>
<td>3.78</td>
<td>4.40 ml</td>
<td>7.5 ml</td>
</tr>
<tr>
<td>Orange juice</td>
<td>3.96</td>
<td>4.9 ml</td>
<td>6.1 ml</td>
</tr>
<tr>
<td>Pineapple juice</td>
<td>4.16</td>
<td>5.7 ml</td>
<td>6.9 ml</td>
</tr>
<tr>
<td>Green tea</td>
<td>6.13</td>
<td>-</td>
<td>0.1 ml</td>
</tr>
<tr>
<td>Lemon tea</td>
<td>4.9</td>
<td>0.1 ml</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>Black tea</td>
<td>4.89</td>
<td>0.2 ml</td>
<td>0.5 ml</td>
</tr>
<tr>
<td>Bisleri</td>
<td>7.27</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Aquafina</td>
<td>7.31</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kinley</td>
<td>7.01</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

✓ energy drinks - higher titratable acidity (TA)
✓ energy drinks - more significant enamel loss - 2x higher
✓ TA significant predictor of enamel dissolution
✓ weight loss greatest = high TA + low pH

Salivary dysfunction – etiology and contributing factors

- dehydration
- stress
- smoking
- systemic disease
- recreational drugs
- chronic renal failure
- autoimmune disorders
- asthma
- mouth breathing
- during exercise

- sleep apnea
- C-Pap machines
- salivary gland pathology
- radiation treatment
- hormone imbalance
- laxative/diuretic abuse
- pharmaceutical and OTC medications (over 1,800 meds)

Saliva - The magic fluid

Saliva

Digestive
- chewing
- bolus formation
- swallowing
- amylase lipase
- taste

Protective
- dilution
- buffering
- lubrication
- remineralization
- antimicrobial actions
- healing
- cleansing

Additional
- speech
- excretion
- trophic
- social interaction

Other examples
- grooming
- thermo-regulation
- olfactory signals

Saliva – Fast facts……..

- peak salivary flow - end of the afternoon
- near zero flow during sleep
- acid substances ↑ salivary flow rates
- 80-90% saliva is stimulated
- parotid gland – 50% of stimulated saliva
Dentinal hypersensitivity

- common condition
- transient tooth pain
- short, sharp sensations
- caused by a variety of exogenous stimuli
  - Thermal (cold)
  - Tactile (touch)
  - Osmotic (sweets or drying the surface)

Structural differences between sensitive and non-sensitive

Non-sensitive | Sensitive
---|---
No of open tubules | x | 8 x
Diameter of tubules | 0.43 | 0.83
Fluid Flow (Poissonille’s law) | y | 16 y

Redheads

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


The magic of xylitol

- interferes with Strep Mutans metabolism
- disrupts biofilm integrity
- promotes neutral pH
- stimulates saliva flow
- shifts equilibrium to enhance remineralization
- increases available calcium and phosphate

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


Comparing Xylitol

<table>
<thead>
<tr>
<th>SWEETENER</th>
<th>% RELATIVE SWEETNESS VERSUS SUCROSE</th>
<th>CALORIES (KILOCALORIE/GRAM)</th>
<th>LAXATION THRESHOLD (GRAMS/DAY)</th>
<th>U.S. REGULATORY STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorbitol</td>
<td>60</td>
<td>2.6</td>
<td>50</td>
<td>GRAS†</td>
</tr>
<tr>
<td>Xylitol</td>
<td>100</td>
<td>2.4</td>
<td>50-90</td>
<td>Food additive</td>
</tr>
<tr>
<td>Sucrose</td>
<td>100</td>
<td>4.0</td>
<td>&gt; 100</td>
<td>GRAS</td>
</tr>
<tr>
<td>Fructose</td>
<td>117</td>
<td>4.0</td>
<td>50-70</td>
<td>GRAS</td>
</tr>
</tbody>
</table>

* Adapted with permission of SPI Polyols.³
† GRAS: Generally regarded as safe.
Novel xylitol products

Garcia-Godoy F, Hicks MJ. Maintaining the integrity of the enamel surface: the role of dental biofilm, saliva and preventive agents in enamel demineralization and remineralization. J Am Dent Assoc. 2008 May;139 Suppl:25S-34S.
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 - 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

Arginine bicarbonate calcium carbonate - keeping saliva neutral
Arginine?

- Tooth surface is negatively charged
- Attracts arginine’s positive charge
- Arginine and calcium carbonate - CaCO₃ promotes precipitation of calcium and phosphate ions into tubules
- Arginine - raises pH to 7

Cummins D. Recent advances in dentin hypersensitivity: clinically proven treatments for instant and lasting sensitivity relief. Am J Dent. 2010 May;23 Spec No A:3A-13A.

Interesting herbal approach

- licorice root extract
- 2x per day
- 10 days
- 2-4 times annually
- stimulates saliva
- reduces *Lactobacillus* and *S. mutans*


Fluoride treatment recommendations

- One minute foams / rinses not endorsed
- Gels – application should be four minutes.
- Varnish application
  - every six months
  - effective caries prevention
  - children, adolescent and adult dentition
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

NovaMin technology

- calcium sodium phosphosilicate
- reacts with saliva – elevates pH to 8-8.5
- calcium and phosphorus ions release
- sodium and calcium cause bacterial cell lyses
- demineralized lesions attract Ca2+ and P5+
- build hydroxyapatite from bottom up


- Stabilized stannous fluoride
- ACP
- Ultramulsion and spilanthes
- treats/prevents caries, gingivitis, hypersensitivity
- occludes tubules
- helps with dry mouth

- 970 ppm stannous - below OTC and Rx levels
- controlled delivery
- consistent with pediatric dosages
- low abrasion - RDH 8
- no gluten, dyes or SLS
- dispensed in office

American Dental Association Council on Scientific Affairs, Fluoride toothpaste use for young children, JADA 2014; 145 (2); 190-19.
Theobromine

- theobromine - found in cacao (chocolate) plus minerals
- growth of larger hydroxyapatite crystals (4X larger)
- occlusion - 7 days
- FDA GRAS (generally regarded as safe) status
- does not contain fluoride

Increase in surface micro hardness - 7 days

Relative Resistance to Acid Attack

50%
Better protection than ordinary fluoride toothpaste.*
Early erosion.......one year

Photos - Courtesy of Richard Erlich, DDS - Ontario, Canada  elmtreedental.com
Increasing the risk for erosion

- 37 X – Citrus twice daily
- 4 X - Sports drinks weekly or soft drinks daily
- Vomiting once a week or more
- GERD
- Low unstimulated salivary flow rate

Fast Facts........
Loosing tooth structure

- pure abrasion 2,500 years to remove 1 mm
- add toothpaste, 100 years
- acid + toothpaste - 2 years to remove 1 mm
- active erosion will not be stained

Slowing down erosion

- drink with a straw
- limit contact time – drink quickly
- drink beverages during meals
- add ice to drinks
- avoid between meal snacks/drinks


Slowing down erosion

- brush before morning juices, etc.
- rinse with water - reduces titratable acidity, not pH
- soft bristle brushes / low abrasion paste


Slowing down erosion

- Chocolate, dairy or cheese after acidic intake
- Xylitol gum, mints, lozenges or spray
- Chew gum to stimulate saliva
- Use bicarbonates - rinse, paste or lozenge

Slowing down erosion

Fresh lemon juice, tap water and bicarbonate – pH measurements 4-25-2014

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>pH measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon juice - fresh - baseline</td>
<td>2.5</td>
</tr>
<tr>
<td>Tap water - Houston - baseline</td>
<td>6</td>
</tr>
<tr>
<td>Tap water - 8 oz + 1/2 tsp lemon</td>
<td>4.5</td>
</tr>
<tr>
<td>Baking soda 1 tsp = 1/2 tsp fresh lemon juice</td>
<td>8.5</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tap water</td>
<td>6 oz water</td>
<td>6</td>
</tr>
<tr>
<td>Tap water + one packet Neil Med</td>
<td>8 oz water</td>
<td>6.5</td>
</tr>
<tr>
<td>Tap water + one packet Neil Med</td>
<td>16 oz water</td>
<td>6</td>
</tr>
<tr>
<td>Tap water + one packet Neil Med + 1 tsp xylitol</td>
<td>8 oz water</td>
<td>6</td>
</tr>
<tr>
<td>Tap water + one packet Neil Med + 1 tsp xylitol</td>
<td>16 oz water</td>
<td>6</td>
</tr>
<tr>
<td>Kroger brand purified drinking water</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>(Carbon filtered, micron filtered and ozonated for purity. Purified through reverse osmosis.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purified water + one packet Neil Med</td>
<td>8 oz water</td>
<td>6.5</td>
</tr>
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<td>16 oz water</td>
<td>6</td>
</tr>
<tr>
<td>Safeway brand Refresh drinking water</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>(Purified water sodium bicarbonate and sodium sulfate: added for taste)</td>
<td></td>
<td></td>
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</table>
Understanding labels

✓ “ose” words - sugar
✓ “ate words” - acid
✓ corn syrup
✓ ascorbic acid

### Nutrition Facts
**Orange Juice**
- Serving Size: 8 fl oz
- Servings per Container: 1
- Calories: 110
- % Daily Value:
  - Total Fat (g): 0 (0%)
  - Sodium (mg): 0 (0%)
  - Potassium (mg): 450 (13%)
  - Total Carbs (g): 26 (9%)
  - Sugars (g): 22
  - Protein (g): 2
  - Vitamin C: 120%
  - Calcium: 2%
  - Thiamin: 10%
  - Vitamin B6: 6%
  - Niacin: 4%
  - Magnesium: 6%
  - Folate: 15%

**Orange Juice**
- Serving Size: 8 fl oz
- Servings per Container: 2
- Calories: 120
- % Daily Value:
  - Total Fat (g): 0 (0%)
  - Sodium (mg): 0 (0%)
  - Potassium (mg): 0 (0%)
  - Total Carbs (g): 29 (10%)
  - Sugars (g): 29
  - Protein (g): 2
  - Vitamin C: 100%
  - Thiamin: 10%

**Ingredients:**
- Water, High Fructose Corn Syrup, and 2% or less of each of the following: Concentrated Juices (Orange, Tangerine, Apple, Lime, Grapefruit), Citric Acid, Ascorbic Acid (Vitamin C), Thiamin Hydrochloride, Vitamin B6, Natural Flavors, Modified Corn Starch, Canola Oil, Sodium Citrate, Cellulose Gum, Xanthan Gum, Sodium Hexametaphosphate, Sodium Benzoate to Protect Flavor, Yellow No. 6, Yellow No. 5.

*Percent Daily Values are based on a 2,000 calorie diet.*
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