

## Caries Management by Risk Assessment : The Caries Balance

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## Disclosure

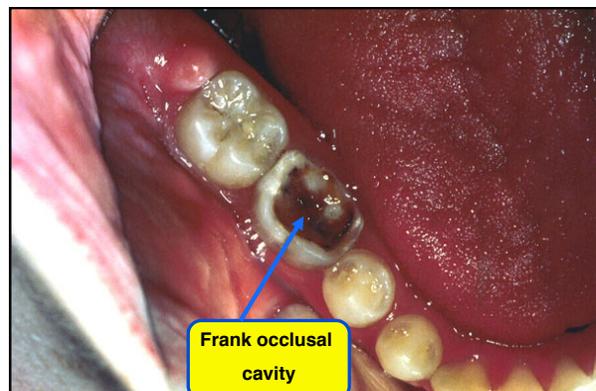
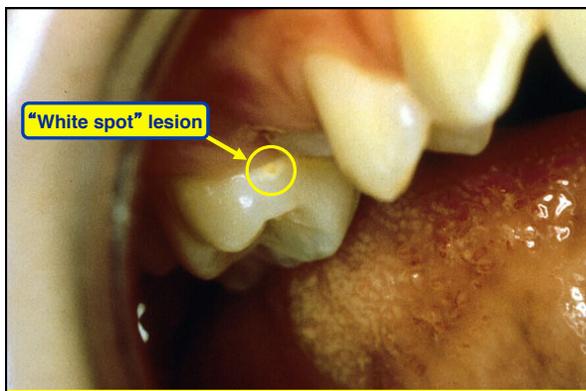
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## What is Dental Caries?

- Dental caries is tooth decay
- Specific bacteria (*Streptococcus mutans*, *Streptococcus sobrinus*, *Lactobacilli* and more) on the tooth surface feed on carbohydrates and make acids as waste products
- Acids travel into the tooth and dissolve mineral - if mineral loss is not halted or reversed a cavity is formed
- Dental caries is a transmissible bacterial infection

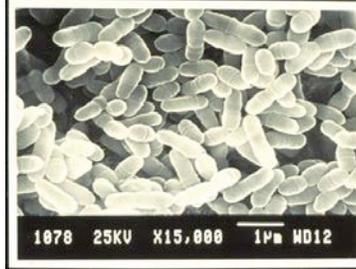






Scanning Electron Micrograph of bacteria on a tooth surface

Acid producing bacteria are usually less than 1 percent of the total flora in the plaque



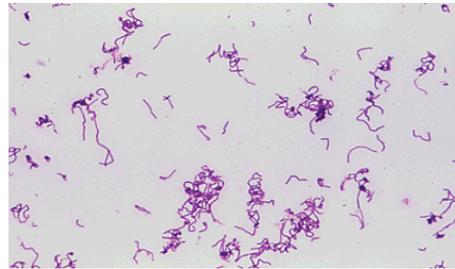
*Streptococcus mutans* culture showing active cell division. *S. sobrinus* is similar. Sucrose leads to extracellular polysaccharides that stick the plaque together

### Mutans Streptococci

This **group** of bacteria contains two primary species that appear in humans

- *Streptococcus mutans* - almost universal
- *Streptococcus sobrinus* - virulent, high risk

Both species produce acids and can live in acid



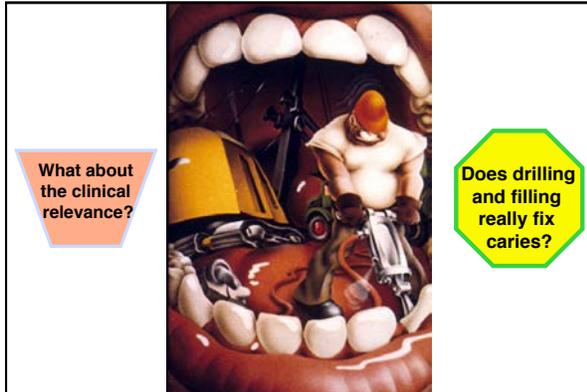
*Lactobacillus* culture. Lactobacilli species produce predominantly lactic acid from fermentable carbohydrates

### Additional Species strongly related to high caries in children

- Tanner and co-workers 2010 and 2011
- Bifidobacteriaceae
- Veillonella
- *Scardovia wiggsiae*
- Watch this space
- Any bacteria that produce acid as a byproduct of metabolism
- Biofilm is a cooperative city

### Additional Species strongly related to occlusal caries in dentin

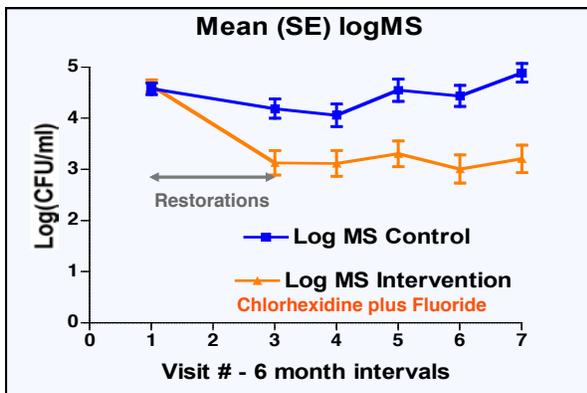
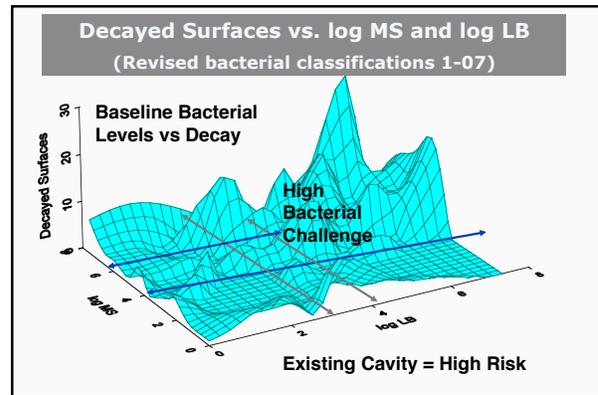
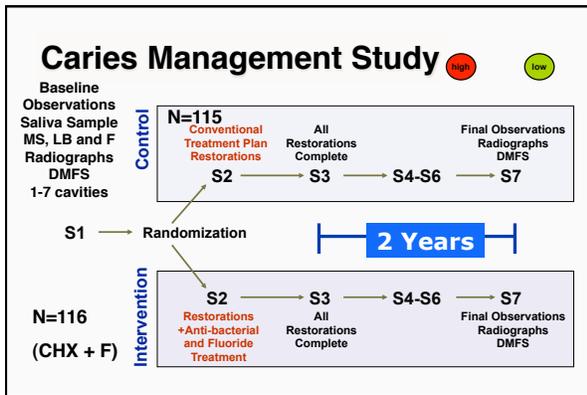
- Lima et al, Caries Res, 2011
- *Lactobacillus casei* and *Lactobacillus fermentum*
- Veillonella species
- *Actinomyces* species
- *Bifidobacterium* species
- Any bacteria that produce acid as a byproduct of metabolism
- Biofilm is a cooperative city



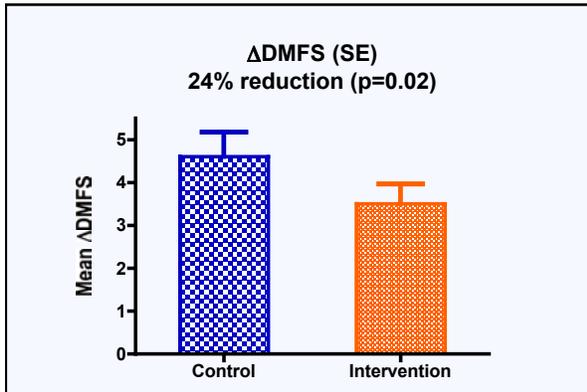
## Clinical Study Results NIH/NIDCR Grant Caries Management By Risk Assessment (Caries Res In Press 2012)

Principal Investigator:  
John Featherstone

Co-investigators:  
Chuck Hoover, Stuart Gansky, Marcia Rapozo-Hilo, Kim Tran,  
Joel White, Jane Weintraub



- ### Patients With Frank cavities
- One or more frank cavities indicates high risk for future new carious lesions
  - Moderate to high levels of mutans streptococci
  - Moderate to high levels of lactobacilli
  - Patients have a high bacterial challenge that most likely can not be completely overcome by fluoride alone
  - Placing restorations does not reduce the bacterial loading in the rest of the mouth



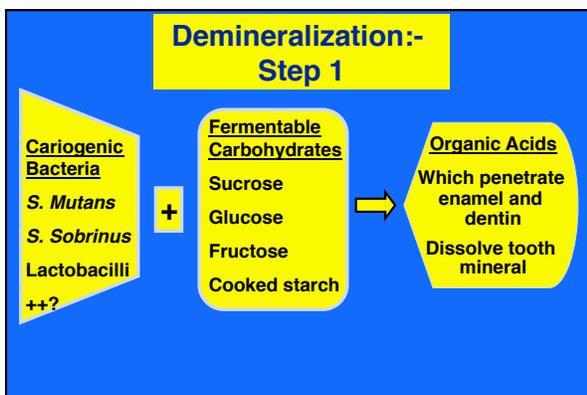
### Caries is a Transmissible Bacterial Infection

- Time for a paradigm shift
- Children infected by mother, caregiver, siblings
- Fluoride is effective only up to a point
- High bacterial challenge can not be completely overcome
- Placing “fillings” has little effect on cariogenic bacterial loading in the mouth
- Need to deal with the infection

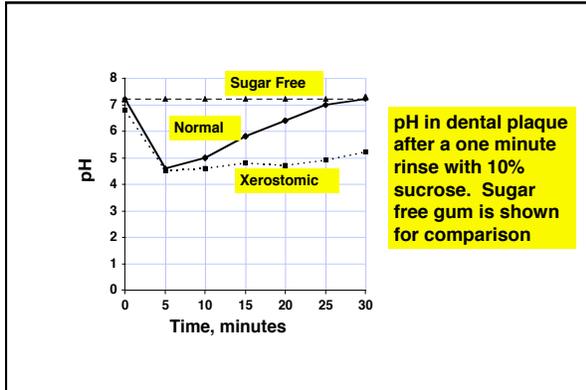
### First Colonizable Hard Surface. Soft tissues can also be colonized before teeth erupt.

### Pathological Factors

- Cariogenic bacteria: mutans streptococci (*S. mutans* and *S. sobrinus*) and lactobacillus species
- Frequency of ingestion of fermentable carbohydrates: sucrose, glucose, fructose, cooked starch
- Reduced salivary function (medication induced; radiation therapy; disease; genetic)

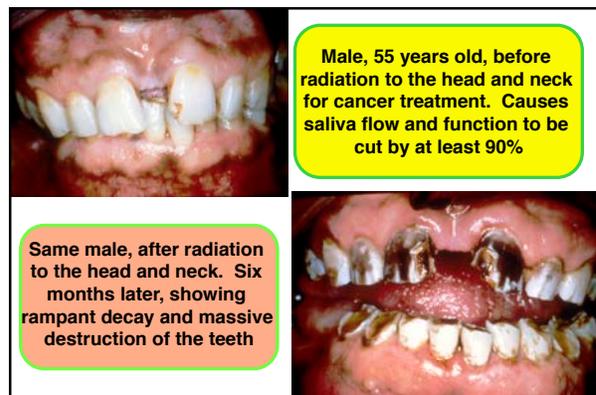


Cariogenic foods contain fermentable carbohydrates such as sucrose, glucose, fructose and cooked starch



- ### Non-cariogenic Sweeteners
- Sorbitol
  - Aspartame
  - Saccharin
  - Sodium cyclamate
  - Xylitol
  - Several others

- ### Pathological Factors
- Cariogenic bacteria: mutans streptococci (*S. mutans* and *S. sobrinus*) and lactobacillus species
  - Frequency of ingestion of fermentable carbohydrates: sucrose, glucose, fructose, cooked starch
  - Reduced salivary function (medication induced; radiation therapy; disease; genetic)



- ### Protective factors
- Salivary components and flow
  - Fluoride, calcium and phosphate: remineralization
  - Antibacterials from extrinsic sources

- ### Saliva Contains Numerous Important Components
- Calcium, phosphate and fluoride
  - Proteins and lipids that form the pellicle that protects the tooth surface
  - Proteins that keep calcium in solution - they maintain supersaturation
  - Buffers: bicarbonate, phosphate, peptides
  - Antibacterial substances & immunoglobulins

## Protective factors

- Salivary components and flow
- Fluoride, calcium and phosphate: remineralization
- Antibacterials from extrinsic sources

## Demineralization:- Step 2

Dental Mineral =  
Carbonated  
Hydroxyapatite  
*Acid soluble*

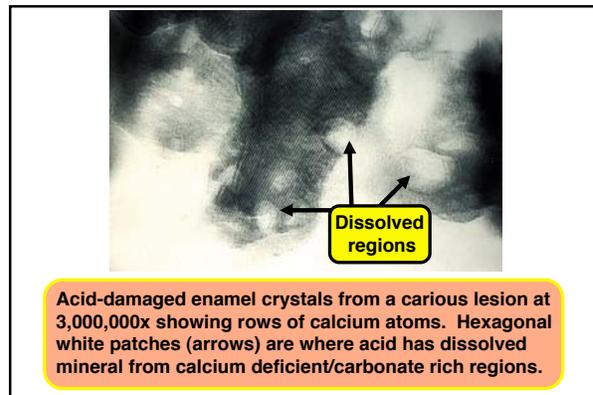
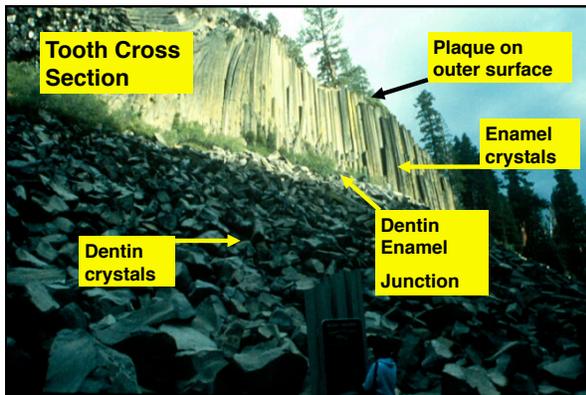
+

Organic  
Acids



Demineralization  
Calcium and  
phosphate into  
solution

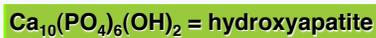
If fluoride is present in the  
solution between the  
crystals it inhibits mineral  
loss



Dental Mineral = carbonated apatite



Most soluble in acid

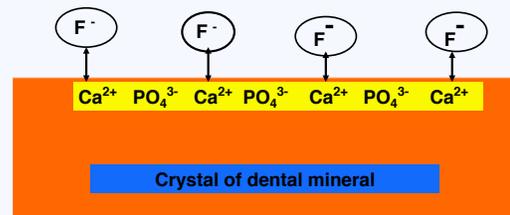


Less soluble



Least soluble

Schematic adsorption of  
fluoride on crystal surfaces  
by fluoride

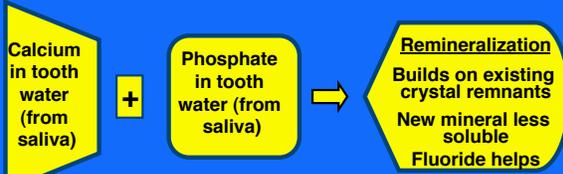




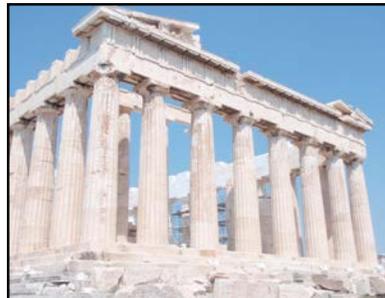
## Fluoride works primarily via topical mechanisms

- Fluoride inhibits demineralization by adsorbing from solution onto tooth mineral crystal surfaces

## Remineralization/Tooth Repair

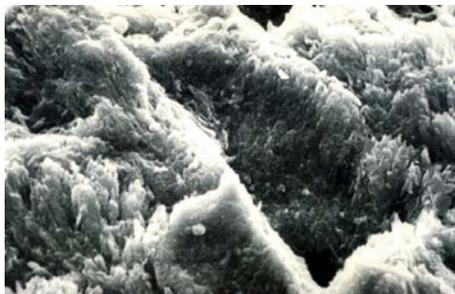


*Fluoride speeds up remineralization -> less soluble mineral*

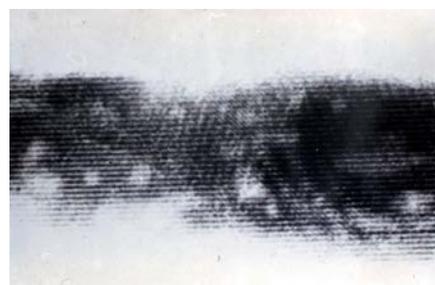


Fluoride speeds up remineralization and makes acid resistant mineral

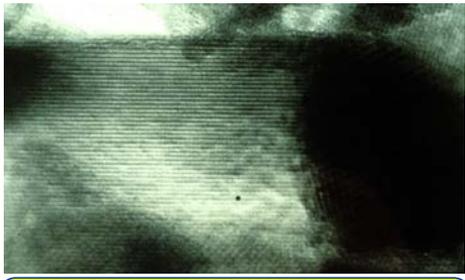
Demineralized surface blocks need to be replaced with new calcium, phosphate and fluoride to make a more acid resistant surface on the crystal



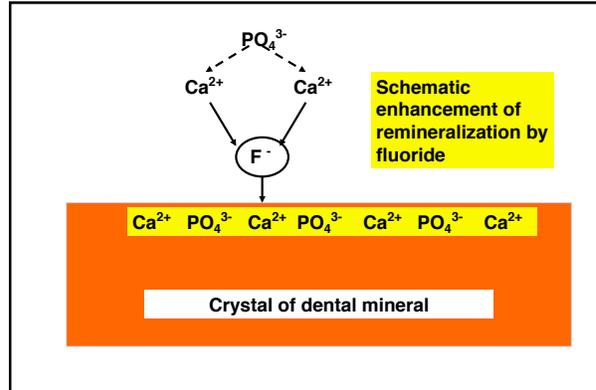
SEM in the body of a carious lesion (~ 30,000x) showing remaining crystal remnants awaiting remineralization



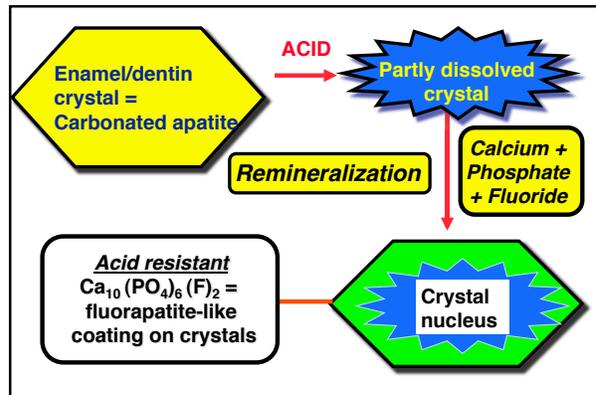
Sound enamel crystal (3,000,000x) dissected from inner enamel showing carbonate rich acid soluble regions (white patches).



Enamel crystal after remineralization with calcium, phosphate and fluoride, showing a well-formed, low solubility, fluorapatite-like veneer overlying the original defective crystal

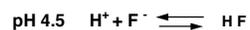
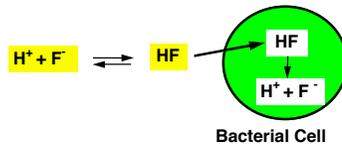


Calcium and phosphate are cemented in place by fluoride providing a new stable wall



## Fluoride works primarily via topical mechanisms

- Fluoride inhibits demineralization by adsorbing from solution onto tooth mineral crystal surfaces
- Fluoride enhances remineralization by combining with calcium and phosphate to make a "fluorapatite-like" remineralized veneer



Fluoride can not enter bacteria in its ionic form, but as the bacteria produce acid HF is formed, which diffuses readily into the cells

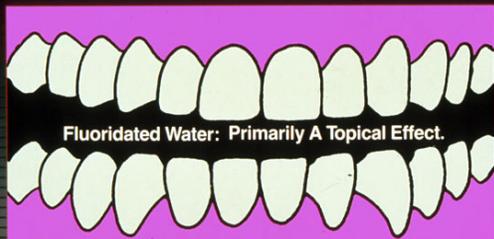
## Fluoride works primarily via topical (surface) mechanisms

(Fluoride in water, foods, beverages, products)

- Fluoride inhibits demineralization
- Fluoride enhances remineralization
- Fluoride can inhibit plaque bacteria



## Fluoridated Water



Fluoride levels in the mouth are sufficient to enhance remineralization

## Fluoride in Drinking Water Effective Posteruptively in Children and Adults

- Hardwick et al, 1982, showed caries reduction of ~27% over 4 years in 12 year olds when fluoride was added to their drinking water
- Stamm et al., 1990, showed reduction in root caries in older adults living in fluoridated drinking water area



Brushing twice daily with a fluoride-containing dentifrice is one of the most effective ways to control dental decay.

High bacterial challenge overcomes the therapeutic effects of fluoride.



Numerous clinical trials showed ~30% reduction with fluoride dentifrice 1000-2800 ppm F.

Curnow, Pine, et al, 2002 reported 56% reduction with supervised brushing twice daily



Over the counter fluoride rinses (0.05% NaF) are very effective in high caries risk patients when used once or twice daily for one minute, plus a fluoride-containing dentifrice. O' Reilly and Featherstone, 1987

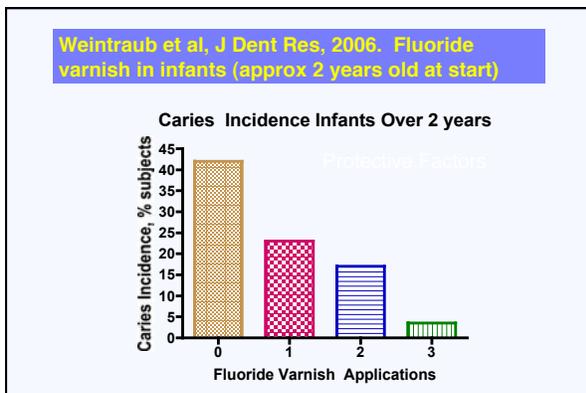
### Office-Applied Fluoride Products Gel ( $\geq 5,000$ ppm F) and Fluoride Varnish

- Do not require continuing patient compliance
- Forms slowly soluble calcium fluoride-like deposits in lesions and the plaque
- Gives slow release fluoride for several weeks
- Three times a year for high risk patients

### Evidence-based Clinical Recommendations: Professionally Applied Topical Fluoride

The Council on Scientific Affairs, American Dental Association  
May, 2006

- ❖ Fluoride gel applied for 4 minutes or more is effective
- ❖ Fluoride varnish applied every 6 months is effective
- ❖ Two or more applications of fluoride varnish per year are effective in high caries risk individuals
- ❖ Office topical applications no added benefit for low risk individuals



Fluoride Varnish for High Risk of All Ages  
White "Vanish" Varnish – 3M ESPE Prev Care

**High fluoride concentration (5,000 ppm F) toothpaste more effective than 1100 ppm F in caries-active (high risk) adolescents**

Nordstrom and Birkhed. Caries Research 2011.  
5000 ppm F toothpaste gave statistically significant preventive fraction of 40% compared to 1450 ppm F toothpaste.  
However, caries progression still occurred in many subjects even with high concentration fluoride use

**High concentration fluoride products for high risk patients. Proven effective for root caries.**



**Clinpro™ 5000 1.1% NaF  
Dentifrice  
3M ESPE  
Contains added calcium**



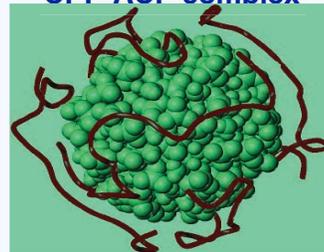
**Conclusions - Fluoride**

- The anti-caries effects of fluoride are primarily topical (surface) in plaque
- The systemic benefits of fluoride are minimal
- Therapeutic levels of F can be achieved from drinking water and fluoride products
- Fluoride therapy may not overcome a high bacterial challenge

**Calcium Phosphopeptide:  
CPP/ACP  
Eric Reynolds - Australia**

Background and mechanism  
Laboratory studies: Three decades  
Clinical Studies: clinical evidence

**Representation of a proposed  
CPP-ACP complex**



Cross et al. 2007 Curr Pharm



## Conclusions

- Limited calcium and phosphate in individuals with reduced salivary function is a common problem
- Calcium and phosphate delivery can be enhanced to improve remineralization
- Great need for novel improved remineralization methods to better alter the “caries balance”, especially in individuals with high bacterial challenge
- MI paste, MI Paste Plus (with fluoride)



## The Caries Balance:

The Basis for Caries Management by Risk Assessment

Caries is a Transmissible Bacterial Infection

The Role of Antibacterials

## The Caries Balance

### Pathological Factors

- Acid-producing bacteria
- Frequent eating/drinking of fermentable carbohydrates
- Sub-normal saliva flow and function

### Protective Factors

- Saliva flow and components
- Fluoride, calcium, phosphate: remineralization
- Antibacterials:- chlorhexidine, xylitol, new?

Caries

No Caries

## Protective factors

- Salivary components and flow
- Fluoride, calcium and phosphate: remineralization
- Antibacterials from extrinsic sources



### **Caries is a Transmissible Bacterial Infection**

- Multiple acid-producing species of bacteria are responsible
- Children are infected by mothers, care-givers, siblings, playmates, through saliva transfer
- Babies and infants are most susceptible from birth to about 4 years of age
- Children infected early have more cavities later in life
- Need to break the chain of infection and deal with the bacteria

### **The early establishment of *S. mutans* in the mouths of infants**

R.J. Berkowitz, H.V. Jordan and G. White  
Archs. Oral Biol. 20:171-174, 1975.  
Demonstrated early infection of infants' teeth by *S. mutans*

Later studies (2000-2003) have shown colonization even before the teeth erupt

### **Similarity of bacteriocins of *S. mutans* from mother and infant**

R.J. Berkowitz and H.V. Jordan  
Archs. Oral Biol. 20:725-730, 1975

Demonstrated the likelihood of transmission from mother to child

### **Distinct bacteriocin groups correlate with different groups of *S. mutans* plasmids**

P.W. Caufield, N.K. Childers, D.N. Allen, J.B. Hansen  
Infect. Immun. 48:51-56, 1985

Transmission of specific strains confirmed by DNA matching

### ***S. mutans* establishment and dental caries experience in children**

S. Alalusua, O.V. Renkonen  
Scand. J. Dent Res. 91:453-457, 1983

Children whose teeth were colonized early by MS showed higher caries experience than those colonized later

## Oral colonization of *S. mutans* in Six-month-old Preerupted Infants

A.K.L. Wan, W.K. Seow, et al.

J.Dent Res. 80:2060-2065,2001

- Showed that *S. mutans* colonized even **before** teeth erupted (50% of infants).
- Related to high *S. mutans* in mothers, increased frequency of sugar intake, breast feeding and habits with saliva transfer from mother to child

## A Longitudinal Study of Streptococcus Mutans Colonization in Infants after Tooth Eruption

A.K.L. Wan, W.K. Seow, et al.

J.Dent Res. 82:504-508,2003

- Colonization began before teeth erupt and increased with age up to 24 months (84% of infants colonized)
- Timing of colonization from birth to 24 months
- Major relationship to sweetened fluids before bed, frequent sugar exposure and snacking, maternal *S. mutans* > 10<sup>5</sup> CFU/ml

## ECC is a transmissible disease

- The primary acid-producing bacteria are transmitted to the infants by
  - Mother/Primary caregiver
  - Other adults and children in close contact
- Transmission can be reduced or delayed if mutans streptococci (MS) and lactobacilli levels are reduced in these individuals



Chlorhexidine Gluconate 0.12%, 10 ml, daily for 1 week reduces MS markedly and LB somewhat after restorations completed. Repeat every month.

- Chlorhexidine was effective at reducing the bacterial challenge in high caries risk individuals even when compliance was problematic
- Preferred regimen is once a day rinse for one week every month for a year
- Monitor success by bacterial testing
- Ideally we need a better antibacterial therapy
- Must combine with remin/fluoride

## What about toddlers/ preschoolers?

- No good antibacterial vehicle available for toddlers - chlorhexidine has negatives
- Chewing xylitol gum inappropriate & mints might be aspirated
- Xylitol wipes? - Spiffies: Unpublished data show caries reduction over one year in infants
- Enlist the mothers and caregivers

## Xylitol

- Xylitol is a 5 carbon "sugar alcohol"
- It looks like sucrose and has about the same sweetness by weight
- It is used in some foods, chewing gum, candies, lozenges, and dental products as a sweetener
- Cariogenic (caries causing) bacteria can not feed on it
- Humans can feed on it and use it as an energy source
- It inhibits the transfer of bacteria from person to person by altering the way the bacteria stick to surfaces

## Influence of maternal xylitol consumption on acquisition of mutans streptococci by infants

E. Soderling, P. Pienihakkinen, J. Tenovuo  
J. Dent. Res. 79:882-887, 2000

**Use of xylitol gum by mothers reduced colonization in infants.**

Xylitol was better than chlorhexidine varnish, which was better than fluoride varnish

**Parallel study showed marked caries reductions after 5 years (10 year results still hold up)**

## Occurrence of dental decay in children after maternal consumption of xylitol chewing gum, a follow-up from 0 to 5 years of age

Isokangas P, Soderling E, Pienihakkinen K, Alanen P

J. Dent. Res. 79:1885-1889, 2000

**Use of xylitol gum by 195 mothers reduced caries in children over 5 years.**

Caries in the xylitol group was reduced by 70% compared to the chlorhexidine varnish or fluoride varnish groups

## Xylitol

- Xylitol chewing gum use enhances remineralization
- It inhibits the transfer of bacteria from person to person by altering the way the bacteria stick to surfaces
- It inhibits future recolonization

## Xylitol Gum, Mints

### Xylitol

- Noncariogenic sweetener
- Inhibits transfer of bacteria from mother to child
- Can reduce loading of cariogenic bacteria in the mouth



## A Few Xylitol Gum Sources

- Epic. <http://www.epicdental.com/departments.asp>  
You can buy gums and mints from this company, including dispensers.
- [www.carifree.com/dentists/products/](http://www.carifree.com/dentists/products/). Carifree has a range of products including xylitol gum and mints, antibacterial rinses, fluoride varnish and an ATP bacterial activity testing meter
- Zellies. Ellie has the full range plus educational materials. <http://www.zellies.com>
- Spry is another company that markets gum and mints to dental offices  
[http://www.homesteadmarket.com/xylitol\\_mints.html](http://www.homesteadmarket.com/xylitol_mints.html)

## Spry Dental Defense System™

- Spry Chewing Gum
- Spry Mints
- Spry Oral Rinse
- Spry Toothpaste
- Spry Infant Tooth Gel
- Rain Oral Mist



## Conclusions: Antibacterial Anticaries Agents

Several avenues are being explored that show promise for clinical applications in the future.

It will take years for clinical studies and regulatory approvals

## CariFree™ Patient Kits

- Treatment Kit
- Prevention Kit
- Starter Kit



## Risk Assessment

Assessing the risk for caries in the future

CRA STUDY

California Dental Association Journal:  
30(10), 2011



Validation of the CDA  
CAMBRA Caries Risk  
Assessment — A Six-Year  
Retrospective Study

Sophie Domejean, Joel M White,  
John D Featherstone

## DISEASE INDICATORS UCSF predoctoral clinics (CDA Jnl Oct 2011)



12,954 baseline CRA

		CAVITATIONS		P-value $\chi^2$	OR*
		N	%		
Restorations last 3 years	No	3,052	51.2	<0.001	1.46
	Yes	2,761	60.5		
Approximal enamel lesions on x-rays	No	3,425	41.5	<0.001	8.21
	Yes	3,059	85.4		
White spots	No	4,636	49.6	<0.001	2.77
	Yes	1,898	73.2		

\*OR = odds ratio. 1.0 = no relationship; > 1.0 = positive relationship; < 1.0 = negative relationship

## BIOLOGICAL RISK FACTORS

12,954 baseline CRA

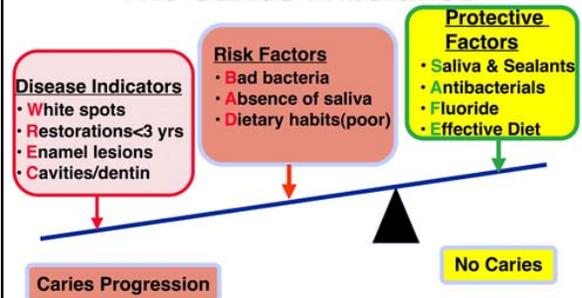
		CAVITATIONS		P-value $\chi^2$	OR
		n	%		
Heavy plaque	No	1,911	42.3	<0.001	2.55
	Yes	3,792	65.1		
Recreational drugs	No	5,783	54.1	<0.001	1.95
	Yes	523	69.6		
Deep pits & Fissures	No	5,079	52.3	<0.001	1.80
	Yes	1,456	66.3		
Frequent snacks	No	3,404	50.1	<0.001	1.77
	Yes	2,348	64		
Inadequate saliva flow	No	4,485	54.6	<0.001	1.27
	Yes	769	60.4		
Exposed roots	No	2,862	52.8	<0.001	1.19
	Yes	3,235	57.1		

## PROTECTIVE FACTORS

		CAVITATIONS		P-value $\chi^2$	OR*
		n	%		
Fluoridated community	No	687	58.3	0.011	0.85
	Yes	5,898	54.4		
Fluoride toothpaste	No	519	59.7	0.003	0.81
	Yes	5,958	54.5		
Fluoride mouthrinse	No	5,379	56	<0.001	0.80
	Yes	971	50.4		

\*OR = odds ratio. 1.0 = no relationship; > 1.0 = positive relationship; < 1.0 = negative relationship

## The Caries Imbalance



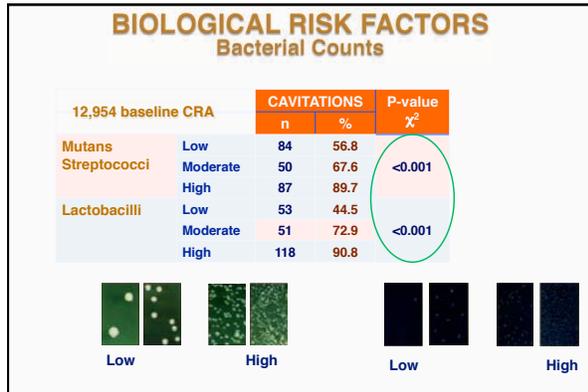
Featherstone, Young and Wolff, 2007

2,571 follow-up CRA (16.0 +/- 12.6 months)

Risk @ Baseline	First follow-up		
	Cavities	Proximal lesions	White spots
Low	23.6 %	9.9 %	10.2 %
Moderate	38.6%	12.4 %	7.7%
High	69.3 %	28.7%	9.96%
Extreme	88%	23.5%	2%
P-Value $\chi^2$	<0.001	<0.001	0.163



Vivadent Test Strips. Used to measure mutans streptococci and lactobacilli bacterial challenge level.



### CariScreen™ ATP Test

- Real time (15 second ) inexpensive screening test for quantitative measure of bacterial activity

CariScreen score had a strong positive correlation  $r = 0.76$  with total cell count, a positive correlation with MS counts  $r = 0.69$ . OHSRU

### Caries Risk Assessment An Actual Case - 1

21 year old female referred by general dentist

- First cavity of her life
- Numerous interproximal lesions on radiographs, several into dentin
- Apparently good oral hygiene
- College student living in an apartment
- White patches observed - Orthodontic treatment completed three years before
- Did bacteria test – Ivoclar/Vivadent CRT

**Vivadent Test Strips. An actual case. Used to measure mutans streptococci and lactobacilli**

### Caries Risk Assessment An Actual Case - 2

**Pathological factors**

- Mutans streptococci and lactobacilli very high
- Frequent (greater than 3 times) between meal snacks of sugars/cooked starch - college student not eating regular meals
- No saliva reducing factors: 1) medications, 2) radiation to the head and neck, 3) systemic reasons
- Saliva flow normal (approximately 2.0 ml/min)
- Previously appliances present - orthodontic brackets

### Caries Risk Assessment An Actual Case - 3

**Protective factors**

- Use of fluoride toothpaste not regular
- Saliva normal and adequate
- Insufficient to overcome the high and frequent acid challenges
- Treatment regimen**
- Chlorhexidine rinse daily one week each month
- High concentration fluoride toothpaste daily
- Diet diary and modification of snacking. Add xylitol gum. Motivated/intelligent individual.
- Restore tooth with cavity. Monitor the remainder
- Caries controlled

Journal

OCTOBER 2007

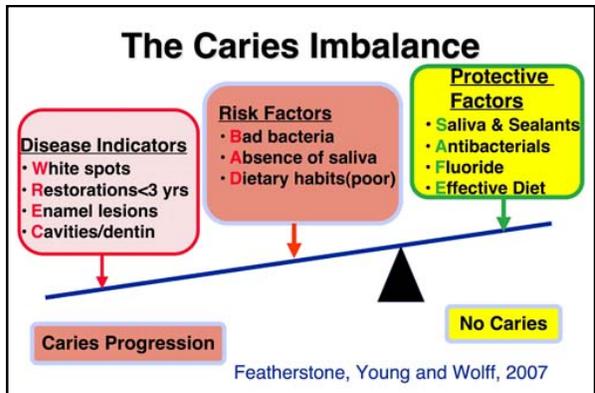
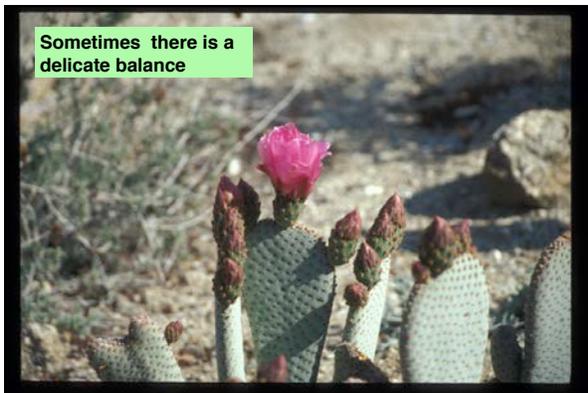
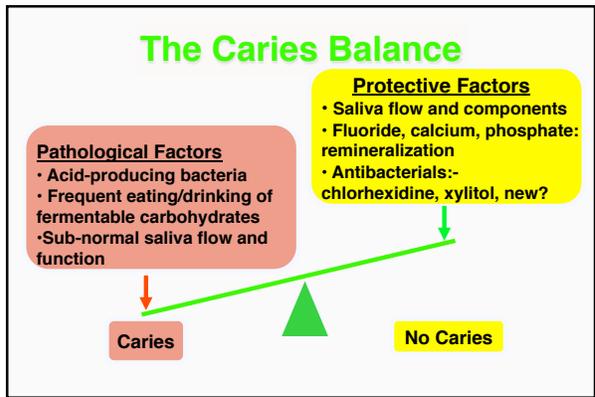
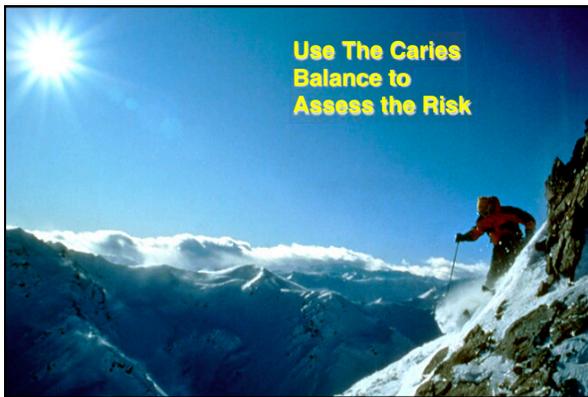
Putting into practice the results of many years of research.

**“Caries Management by Risk Assessment”**

October, November 2007. On line, free

California Dental Association Journal based upon the **“Caries Balance”**

<http://www.cdafoundation.org/journal>





## Caries Risk assessment (Age 6 years and older/adult) - 1

### 1. Disease Indicators = Clinical Observations

- (a) Visible cavities present
- (b) Caries restored in last 3 years
- (c) Interproximal caries lesions/radiolucencies
- (d) White spots on enamel surfaces

Any one of these signals a bacteria test for MS and LB or overall bacterial activity (ATP test)

These are all clinical observations that tell us nothing about the cause of the disease - they indicate presence of disease

## Caries Risk assessment (Age 6 years and older/adult) - 2

### 2. Risk Factors (Biological determinants of caries risk)

- (a) ATP activity medium or high - by test meter – all patients
- (b) Visible heavy plaque on teeth
- (c) Frequent (greater than 3 times) between meal snacks of sugars/cooked starch
- (d) Deep pits and fissures
- (e) Recreational drug use
- (f) Inadequate saliva flow (less than 0.5 ml/min)
- (g) Saliva reducing factors: 1) medications, 2) radiation to the head and neck, 3) systemic reasons, e.g. Sjogren's syndrome
- (h) Exposed tooth roots
- (i) Orthodontic appliances present

## Caries Risk assessment (Age 6 years and older/adult) - 3

### 3. Protective Factors

- (a) Lives/works/school in community with fluoridated water
- (b) Uses fluoride toothpaste once daily
- (c) Use fluoride toothpaste at least twice daily
- (d) Uses fluoride rinse/gel daily
- (e) Uses 5000 ppm F toothpaste daily
- (f) Fluoride varnish in last 6 months
- (g) Office F topical in last 6 months
- (h) Chlorhexidine rinse prescribed/used daily for 1 week every month last 6 months
- (i) Xylitol gum/candies 4 times daily last 6 months
- (j) Calcium/phosphate paste last 6 months
- (k) Saliva flow visibly adequate or > 1 ml/min by test

## Caries Risk Assessment (Age 6 years - adult)-4

4. Bacterial test for (ATP) for all as a baseline measure. High ATP signals high bacterial challenge
5. Count the yes's. Assess caries risk and check risk as extreme, high, moderate or low
6. Treatment Plan  
Includes home care, office preventive treatments and restorative work
7. Home Care Recommendations
8. Recall and Re-assessment of Caries Risk

## CariScreen™ ATP Test

- Real time (15 second)
- inexpensive
- screening test for quantitative measure of bacterial activity



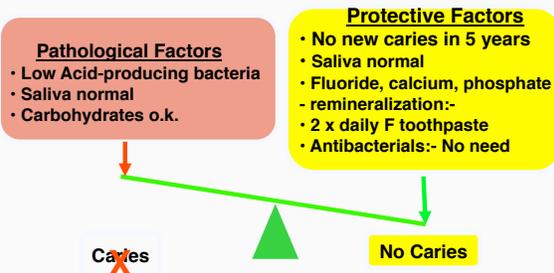
CariScreen score had a strong positive correlation  $r = 0.76$  with total cell count, a positive correlation with MS counts  $r = 0.69$ . OHSRU



## What is the Caries Risk of this Individual? 35 year old female

- No new caries lesions in the last 5 years
- No symptoms of salivary dysfunction (dry mouth), no medications with salivary side effects
- Assume low cariogenic bacteria levels or confirm with ATP tester (less than 1500)
- Not a frequent snacker

## Low Risk Patient



## Therapy for Low Caries Risk Individual 35 year old female

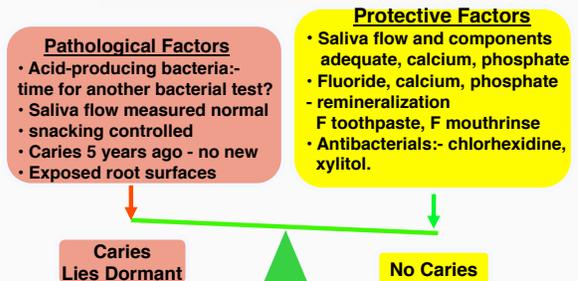
- Maintain 2 x daily fluoride toothpaste brushing and other habits.
- Recall 12 months.



## What is the Caries Risk of this Individual? 60 year old male

- Root canal 5 years ago. No new caries by exam
- No symptoms of salivary dysfunction (dry mouth), but one medication with salivary side effects
- ATP test score 2,400 previously after chlorhexidine use
- Not a frequent snacker
- Exposed root surfaces

## Moderate Risk Patient



## Moderate Caries Risk Individual 60 year old male

- 2 x Daily F toothpaste brushing
- 2 x Daily F mouthrinse (ACT or Fluorigard) 3 weeks
- Conduct bacterial test
- Maintain snacking and other habits as is
- Xylitol chewing gum or mints daily
- Chlorhexidine rinse 10 ml daily for one week every month for the next 6 months, depending on result of bacterial test
- Recall at 6 months and repeat risk assessment and bacterial test



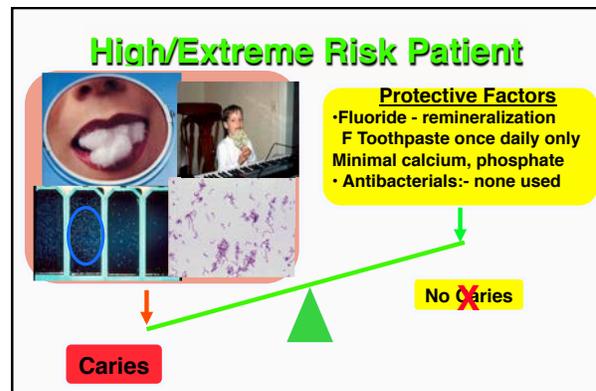
## CariFree™ Patient Kits

- Treatment Kit
- Prevention Kit
- Starter Kit



## What is the Caries Risk of this Individual? 50 year old female

- Several radiographic lesions into dentin
- Symptoms of salivary dysfunction (dry mouth), taking anti-anxiety medication, and major analgesic daily for two years.
- Risk assessment signals to do a bacteria test – ATP score 4,200
- Admits to being a frequent snacker



## Extreme Caries Risk Individuals

- High Risk plus severe hyposalivation. Measure saliva flow rate (less than 0.5 ml/minute)
- Same therapy as for high risk individuals PLUS:
- Baking soda rinse 4x daily (2 teaspoons in 8 ounces water)
- Consider fluoride trays for home use (1.1% neutral sodium fluoride gel) daily
- Consider calcium phosphate home use gel
- Recall 3 months and repeat F varnish etc.



## Extreme High Risk Patient



Caries On Hold

### Protective Factors

- Office applied Fluoride Varnish
- Chlorhexidine 10 ml daily one week a month for 6 months
- Brush with high 5000 ppm F toothpaste daily - enhance remineralization
- Xylitol gum 4x daily
- Baking soda rinse
- Consider MI paste
- Recall 3-6 months

No New Caries

Fluoride varnish for high and extreme risk adults as well as children





**Caries risk assessment procedures and treatments for children aged 0-5 years, can be accessed in the October 2007 CDA Journal Ramos-Gomez et al., Ramos-Gomez et al, CDA Journal November 2010**

[www.cdafoundation.org/journal](http://www.cdafoundation.org/journal)



**FDI statement 2002**

**Minimal Intervention in the Management of Dental Caries**

1. Modification of the oral flora
2. Patient education
3. Remineralization of non-cavitated lesions of enamel and dentin
4. Minimal operative intervention of cavitated lesions
5. Repair of defective restorations

## Minimally Invasive Dentistry

- The basic principle is to preserve as much of the natural tooth structure as possible while at the same time encouraging remineralization of early lesions to inhibit further progression.
- Maintaining a balance between caries pathological and protective factors is the key to success and the oral health of the patient

Featherstone, April, 2004

## Conservative Caries Management by the Dental Team

- Detect caries lesions early enough to reverse or prevent progression
- Assess caries risk
- Use fluoride and/or antibacterial therapy based on observations
- Use minimally invasive restorative procedures to conserve tooth structure

It is an uphill struggle to get faculty, students and practitioners to accept the practical application of the "caries balance" and caries management by risk assessment, BUT it works and patients are grateful

