# Breakthrough Strategies for Preventing Early Childhood Caries

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#### Innovations in the Prevention and Management of ECC Oct. 23-24, 2014

- This conference goals were to assess the evidence, as well as the potential, of emerging approaches that can reduce ECC.
- The conference also convened a panel to review the literature assessments and conference discussions in order to start the process of developing evidence-based clinical recommendations that will reduce the incidence and improve the management of ECC.

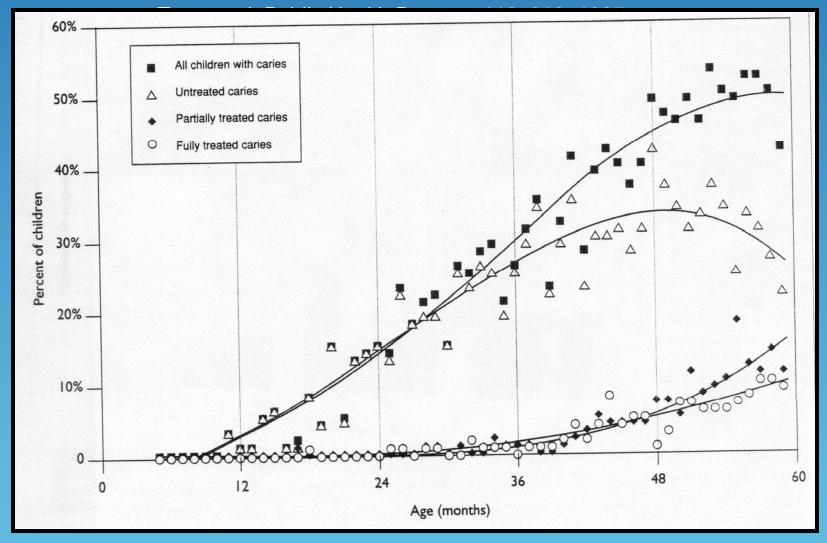
### 12 month old



#### 36 month old

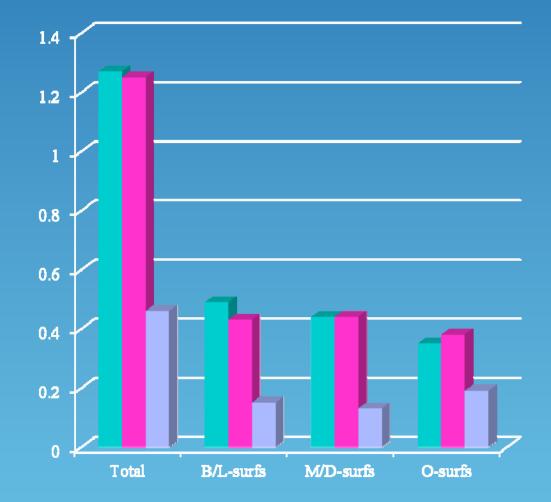


### Caries and Treatment Levels in 5,171 Arizona Preschool Children



NHANES Surveys: Mean number of decayed surfaces in primary teeth by surface type for children, age 2-5 years

1988-1994 1999-2004 2011-2012



Dye and Hsu, 2015 (in press)

# **Conventional Wisdom**

- Oral health risk assessment is an important component of ECC prevention
- Antimicrobial interventions (chlorhexidine, iodine, xylitol) reduced cariogenic microorganisms and ECC.
- Fluoride toothpaste and fluoride varnish greatly reduce ECC.
- Restorative dentistry is effective in disease management of ECC.
- Education and behavioral change strategies are an important component of ECC prevention.

# Value of Some Risk Assessment Strategies

<ul> <li>Previous caries experience</li> </ul>	2++
<ul> <li>Mutans streptococci colonization</li> </ul>	2++
<ul> <li>Dentists subjective judgment</li> </ul>	2++
<ul> <li>Frequent sugar consumption</li> </ul>	
<ul> <li>Presence of tooth defects</li> </ul>	2++
<ul> <li>Maternal factors</li> </ul>	2+
<ul> <li>Socioeconomic status</li> </ul>	2++

2++ from high quality studies; 2+ well conducted studies Sign 2014

#### Caries Risk Assessment for 0-5 Year Olds (AAPD, 2015)

	High Risk	Moderate Risk	Protective Factors
Biological Factors			
Mother/primary caregiver has active caries	Yes		
Parent/caregiver has low SES	Yes		
Child has >3 between meal sugar snacks	Yes		
Put to bed with a bottle containing sweets	Yes		
Child has special health care needs		Yes	
Child is a recent immigrant		Yes	
Protective Factors			
Child exposed to fluoridated drinking water			Yes
Child has teeth brushed daily with F toothpaste			Yes
Child receives professional topical fluoride			Yes
Additional home measures			Yes
Child has dental home/regular dental care			Yes
Clinical Findings			
Child has white spot lesions or enamel defects	Yes		
Child has visible caries	Yes		
Child has elevated mutans streptococcus	Yes		
Child has plaque on teeth		Yes	

# AAP Risk Assessment Tool

Patient Name: Visit:	Date of Birth: month, ☐ 15 month, ☐ 18 month, ☐ 2 other	Date: 24 month,
RISK FACTORS	CLINICAL FINDINGS	PROTECTIVE FACTORS
<ul> <li>Mother or primary caregiver had active decay in the past 12 months Yes No</li> <li>Mother or primary caregiver does not have a dentist Yes No</li> <li>Continual bottle/sippy cup use with fluid other than water Yes No</li> <li>Frequent snacking Yes No</li> <li>Special health care needs Yes No</li> <li>Medicaid eligible Yes No</li> </ul>	<ul> <li>Multicle spots or visible decalcifications in the past 12 months Yes □ No □</li> <li>Mobvious decay Yes □ No □</li> <li>Mobvious decay Yes □ No □</li> <li>Restorations (fillings) present Yes □ No □</li> <li>Visible plaque accumulation Yes □ No □</li> <li>Gingivitis (swollen/bleeding gums) Yes □ No □</li> <li>Teeth present Yes □ No □</li> <li>Teeth present Yes □ No □</li> <li>Healthy teeth Yes □ No □</li> </ul>	<ul> <li>Existing dental home Yes No</li> <li>Drinks fluoridated water or takes fluoride supplements Yes No</li> <li>Fluoride varnish in the last 6 months Yes No</li> <li>Has teeth brushed twice daily Yes No</li> <li>Has teeth brushed twice daily Yes No</li> <li>Massessment/PLAN</li> </ul> <b>ASSESSMENT/PLAN Caries Risk:</b> <ul> <li>Low</li> <li>High</li> </ul> <b>Completed:</b> <ul> <li>Anticipatory Guidance</li> <li>Fluoride Varnish</li> <li>Dental Referral</li> </ul>
Self Management Goals: Regular dental visits Dental treatment for parents Healthy snacks Brush with fluoride toothpaste	□ No soda □ Less/No juice □ Wean off bottle 2X/day □ Only water in sippy cup	□ Xylitol □ Drink tap water □ Less/No junk food or candy

### Effect of CHX or PVP on MS and LB

Study name	Intervention	Outcome		Statis	tics for	each st	udy	Odds ratio and 95% CI
Effect of intervention/t	entiment on NC m	dualias	N	Odds ratio	Lower	Upper Timit	P-Value	
El-Housseiny, 2005	PVP-I + F	MS	54	3.33	0.55	20.22	0.190	
Berkowitz, 2009	PVP-I	MS	77	0.63	0.35	1.13	0.119	
Twetman, 1999	CHX	MS	37	0.59	0.09	3.77	0.577	
	F/CHX	MS	35				- 40304	
Lobo. 2005	F/CPP-ACP	MS	1.	0.34	0.10	1.14	0.080	
Plonka, 2013		MS	622 172	0.90	1.03		0.041	
Plotzitza, 2005	F/CHX	MS			0.28	2.89	0.859	
Pukallus, 2013	F/CHX	MS	234 248	0.97	0.47	2.00	and the second se	
Stecksen-Blicks, 2009	F / Probiotic	-NAG	246	1 16	0.50	2.72	0.732	
Subtotal				0.99	0.73	1.34	0.937	Ŷ
Effect of intervention/t	reatment on LB red	juction						
El-Housseiny, 2005	PVP-I+F	LB	54	0.16	0.02	1.57	0.116	
Pionka, 2013	F/CPP-ACP	LB	622	1.10	0.72	1.70	0.654	
Pukallus 2013	F/CHX	LB	234	0.91	0.49	1.69	0.769	
Stecksen-Blicks, 2009	F / Probiotic	LB	248	1 39	0.63	3,09	0 413	
Subtotal				1.05	0.76	1,44	0.774	•
Overall Effects				1.02	0.81	1,27	0.888	
Heterogeneity: $\chi^2 = 15.2$	75; df = 11; P = 0.1)	70; I <sup>2</sup> ≠ 28%						
Test for overall effect: Z	= 0.141: P = 0.888						a	Favours Intervention Favours Control

#### Li and Tanner, 2015 (in press)

# Effect of Xylitol on MS

Study name	Intervention	Outcome		Statisti	cs for e	dy	Odds ratio and 95% CI		
Effect of intervent	tion/treatment on MS	reduction	N	Odds ratio	Lower	Upper limit	P-Value		
Aaltonen, 2000	Xylitol_tablet+NaF	MS	122	0.29	0.08	1.04	0.058		
Autio, 2002	Xylitol_gum	MS	61	0.28	0.07	1.13	0.073		
Oscarson, 2006	Xylitol_tablet	MS	132	0.85	0.39	1.61	0.667	-	
Seki, 2011	Xylitol_gum	MS	161	0.45	0.23	0,69	0.022	-8-	
Zhan, 2012	Xylitol_wipe	MS	44	0.56	0.17	1.62	0.335		
MS Overall Effect	ls			0.51	0.34	0.78	0.002		
	= 3 309, df = 4; P = 0.50 act: Z = -3 143; P = 0.00								

Li and Tanner, 2015 (in press)

### Effect of Antimocrobial Maternal Interventions on ECC

and the second sec	Intervention	Outcome	Duration		Statis	tics for	each st	udy	Odds ratio and 95% C
			N	Odds ratio	Lower	Upper	P-Value		
ffect of xylitol or	ECC reduction				THEFT				and the second se
Alamoudi, 2014	Xyiitol	ECC	24 mp	60	0.26	0.07	0.95	0.041	
ontana, 2009	Xylitol	ECC	9 m0	97	1,83	0,51	6,54	0.354	
lanno 2011	Xylitol	ECC	3 mo	60	0.68	0.19	2.39	0.545	
sokangas, 2000	Xy (o)	ECC	60 mo	169	019	0.09	0.41	0,000	
aitala 2013	Xylitol	ECC	120 mo	169	0.68	0.37	1.25	0.219	
Diak, 2012	Xvitol	ECC	24 mo	.90	0.26	0,10	0.65	0.004	
Thorild, 2006	Xylitol	ECC	48 mo	173	0.36	0.14	0.95	0.040	-0-
Subtotal					0.43	0.31	0.61	0.000	$\diamond$
ffect of xylitol or	ECC reduction				16.5				
asanayake, 2002	CHX	ECC	48 mo	75	1.26	0,55	2,87	0.580	
Fontana, 2009	Sorbitol	ECC	9 mo	97	1.51	0.44	5.23	0.516	
Sunay, 1998	CHX-FV	ECC	48 mo	66	0.13	0.04	0.42	0,001	
sokangas, 2000	CHX	ECC	60 mo	169	1 18	0.44	3 17	0.737	
Ramos-Gomez. 20	11 CHX-FV	ECC	36 mo	361	1.00	0.59	1,70	0.997	•
Robertson, 2013	CHX	ECC	24 mo	367	101	0.69	1.46	0.979	•
horild, 2006	CHX/Xy//Son	6 ECC	48 mo	173	0.67	0.27	1.65	0.382	
Subtotal					0.93	0.72	1.20	0.573	9
overall Effects feterogeneity: χ <sup>2</sup> =	39.258, df = 13, P <	0.001: ( <sup>2</sup> = 6)	56		0.71	0.58	0.87	0.001	
est for overall effe	ct Z = -3.278, P = 0	001							Favours Intervention Favours

#### Li and Tanner, 2015 (in press)

# Effect of Xylitol on Caries

П	Experime	Experimental- Xylitol			ontrol			Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Alanen (Finland) et al 2000	2.1	2.8	147	1.6	2.5	179	10.9%	0.19 [-0.03, 0.41]	
Alanen et al 2000	1.9	2.6	115	4.4	4.4	146	10.8%	-0.67 [-0.92, -0.42]	•
Kavori et al 2003	1.2	2	328	1.6	2.3	458	11.1%	-0.18 [-0.33, -0.04]	•
Machiuskiene et al 2001	3.4	3.8	99	4.3	4.8	97	10.7%	-0.21 [-0.49, 0.07]	•
Makinen et al 1995	-0.7	0.5	95	5	0.5	89	5.4%	-11.35 [-12.56, -10.15]	<b></b>
Makinen et al 1996	1.8	2.3	36	4.9	3.7	86	10.0%	-0.92 [-1.33, -0.51]	+
Sintes et al 1995	5	3.7	840	5.7	4.1	837	11.2%	-0.18 [-0.28, -0.08]	•
Sintes et al 2002	1.3	1.9	1280	1.5	2	1259	11.2%	-0.10 [-0.18, -0.02]	•
Stecken-Blicks et al 2008	2.7	4.3	56	1.7	3.5	64	10.3%	0.26 [-0.10, 0.62]	•
Zhan et al 2012	0.05	0.22	20	0.53	0.74	17	8.4%	-0.89 [-1.57, -0.21]	+
Total (95% CI)			3016			3232	100.0%	-0.88 [-1.26, -0.49]	•
Heterogeneity: Tau <sup>2</sup> = 0.35;	Chi <sup>2</sup> = 380	.72, df =	9 (P <	0.0000	1); I <sup>2</sup> =	= 98%			-10 -5 0 5 10
Test for overall effect: Z = 4.	44 (P < 0.0	0001)							10 5 0 5 10
resciol overall effect. 2 – 4.		,0001)							Favours (Xylitol) Favours (o

Guinto, et al, 2015 (in preparation)

### Effect of Fluoride on MS and LB

Study name	Intervention	Outcome		Statis	tics for	each st	tudy	Odds ratio and 95% CI
Effect of intervention/t	reatment on MS r	duction	N	Odds ratio	Lower	Upper limit	P-Value	
Lobo, 2008	F/CHX	MS	35	0.34	D 10	1.14	0.060	
Plonka, 2013	F/CPP-ACP	MS	622	1.93	1.03	3 62	0.041	
Plotzitza, 2005	F/CHX	MS	172	0,90	0,28	2.89	0.859	
Pukallus, 2013	F/CHX	MS	234	0.97	0.47	2.00	0.943	
Stecksen-Blicks, 2009	F / Probiotic	MS	24B	1.16	D.50	2.72	0.732	
Subtotal				1.15	0.79	1.86	0.466	<
Effect of intervention/t	reatment on LB re	duction						
Plonka, 2013	F/OPP-ACP	LB	622	1.10	0.72	1.70	0.654	
Pukallus, 2013	F/CHX	LB	234	0.91	0.49	1.69	0.769	
Stecksen-Blicks, 2009	F / Probiotic	LB	248	1.39	0.63	3.09	0,413	
Subtotal				1 09	0.79	1,51	0.607	~
Overall Effects				1.11	0.87	1.42	0.386	
Heterogeneity: $\chi^2 = 7.61$	7; df = 7; P = 0.368	i: 1 <sup>2</sup> = 670						
Test for overall effect: Z	The second se							
								6.1 1 10 Favours Intervention Favours Control

Lee and Tanner, 2015 (in press)

# Effect of Fluoride Toothpaste on Caries

Author and Year	Preventive Fraction, Significance
Schwarz, 1998	42.7, Significant
You, 2002	16.1, Significant
Rong, 2003	30.6, Significant
Jackson, 2005	11.9, Non-Significant
Fan, 2008	41.9, Significant
	Overall 30.9, Significant

#### Effect of Fluoride Varnish on Caries

Author and Year	Std. Mean Difference/Significance
Holm, 1979	43, Significant
Grodzka, 1982	07, Non-Significant
Clark, 1985	18, Non-Significant
Frostell, 1991	38, Significant
Audio-Gold, 2001	34, Non-Significant
Weintraub, 2006	33, Significant
Hartman, 2007	.03, Non-Significant
Lawrence, 2008	08, Non-Significant
	Overall19, Significant

JADA, 2013

#### Effect of Restorative Care on MS and LB

l Study name	Intervention	Outcome		Statis	tics for	each s	tudy	Odds ratio and 95% C
			N	Odds ratio	Lower limit	Upper limit	P-Value	
Effect of interver	ntion/treatment on MS r	eduction						
Amin, 2004	FMR-GA / PVP-I	MS	25	0.77	0.19	3.21	0.722	
Chase, 2004	FMR-GA/ FV	MS	79	0,58	0.22	1.54	0.271	
Hughes, 2012	FMR-GA/ FV	MS	117	0.35	0.09	1.28	0.112	
Klinke, 2012	FMR-GA/ CHX	MS	50	0.30	0.12	0.73	800.0	-8-
Lilsas, 2010	FMR-GA	MS	39	0.68	0.39	1.21	0.193	
Simratvir 2010	FMR-GA / PVP-I	MS	30	0.80	0.22	2.95	0.743	
Twetman, 1999	FMR-GA	MS	108	0.15	0.05	0.45	0.001	
Zhan, 2006	FMR-GA / NaF+PVP-	MS	22	0.45	0.10	2.08	0.306	
Subtotal				0.48	0.34	0 68	0.000	•
ffect of interver	ntion/treatment on LB r	eduction						
Klinke, 2012	FMR-GA/CHX	LB	50	0.18	0 07	0.47	0.000	
Twetman, 1999	FMR-GA	LB	108	0.03	0.01	0.07	0.000	-8-
Zhan: 2006	FMR-GA/NaF+PVP-	LB	22	0.25	0.05	1.22	0.086	
Subtotal				0.08	0.04	0.14	0.000	$\diamond$
Overall Effects				0.30	0.22	0.40	0.000	· · · · · · · · · · · · · · · · · · ·
Heterogeneity: x2	= 47.128; df = 10; P < 0)	001:12 = 79%						
Test for overall eff	lect: Z = -7.963, P < 0.00	1						0.01
								Favours Intervention Favou

## Effect of Motivational Interviewing on Diet

Study name			Stat <u>istics f</u>	foreachst	udy		d+-(95%-CI)				
	d	SE	Variance	LL	UL	Z-Value	p-Value				
Black et al. (2010)	0.206	0.150	0.022	-0.088	0.500	1.374	0.170		+		
Davoli et al. (2013)	0.295	0.108	0.012	0.084	0.506	2.744	0.006		-		
Ismailet al. (2011)	0.537	0.084	0.007	0.371	0.703	6.358	0.000			-()	
MacDonellet-al.(2012)	0.420	0.363	0.132	-0.293	1.132	1.155	0.248				
Neumark-Sztainer et al. (2010)	0.129	0.106	0.011	-0.079	0.337	1.218	0.223		]-[-	]	
Taveras et al. (2011)	0.127	0.096	0.009	-0.060	0.315	1.329	0.184		]+	]	
Van Grieken et al. (2013)	0.048	0.118	0.014	-0.183	0.278	0.405	0.686			-	
	0.239	0.078	0.006	0.085	0.393	3.048	0.002		ŀ	$\bigcirc$	
								-1.00 -0.50	0.00	0.50	1.00
								<b>F</b> avors C	ontrol¶	Favors Tre	eatment¶
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Porrolli et al. 20	<u>م ۲</u> (:										

Borrelli et al, 2015 (in press)

# Effect of Chronic Disease Management

	Boston Children's Hospital			St. Joseph Hospital		
Outcomes	ECC (403) %	Baseline (N=129) %	Improvement %	ECC (234) %	Baseline (N=80) %	Improvement %
New cavitation	26	75	▼65	41	71	▼58
Pain	13	22	▼38	7	31	▼23
Referral to Operating Room	11	21	▼48	15	25	▼68

Ng et al., 2012

# **Conventional Wisdom**

- Oral health risk assessment is an important component of ECC prevention (there are good associations; does using risk assessment affect caries incidence?)
- Antimicrobial interventions (chlorhexidine, iodine, xylitol) reduced cariogenic microorganisms (small effect) and ECC (no effect).
- Fluoride toothpaste (good) and fluoride varnish (modest) reduce ECC.
- Restorative dentistry is effective in disease management of ECC (affects microbiology short term, no effect on caries incidence).
- Education and behavioral change strategies are an important component of ECC prevention (evidence for motivational interviewing).

#### **Breakthrough Strategies for Preventing Early Childhood Caries**

2015 NOHC, April 29, 2015

Presenters: Bill Maas, Jane Koppelman, Norman Tinanoff, Man Wai Ng

#### Resources

American Academy of Pediatric Dentistry. Guideline on Caries-risk Assessment and Management for Infants, Children, and Adolescents. Available at: http://www.aapd.org/policies.

DentaQuest Institute. Early Childhood Caries (ECC) Collaborative. Available at https://www.dentaquestinstitute.org/learn/quality-improvement-initiatives/early-childhood-caries-ecc-collaborative.

Ng M, Ramos Gomez F, Lieberman M, et al. Disease management of Early Childhood Caries: ECC collaborative project. Int J Dent 2014 doi:10.1155/2014/327801

Tinanoff N. Proceedings of the Symposium, "Innovations in the Prevention and Management of Early Childhood Caries". <u>Pediatric Dentistry</u> (May/June 2015)

Tinanoff N and Tillis T. Early Childhood Caries Resource Center, Elsevier Publishing. <u>http://earlychildhoodcariesresourcecenter.elsevier.com/</u>