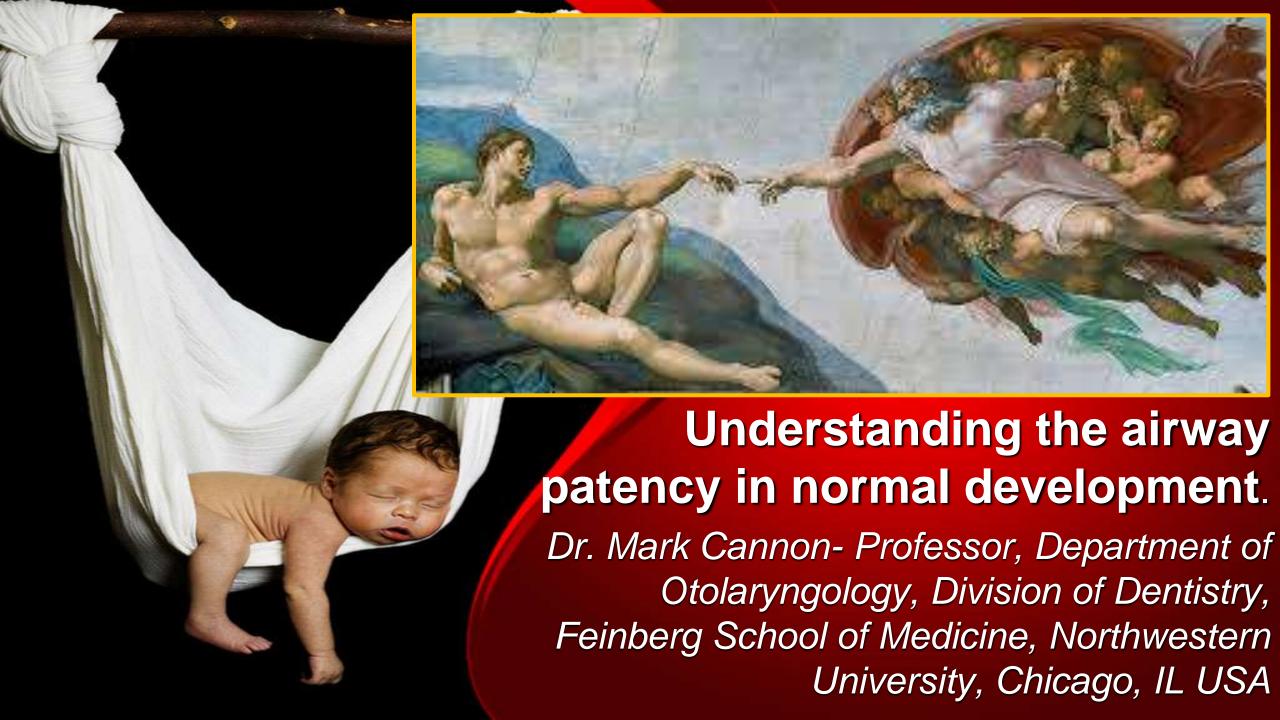




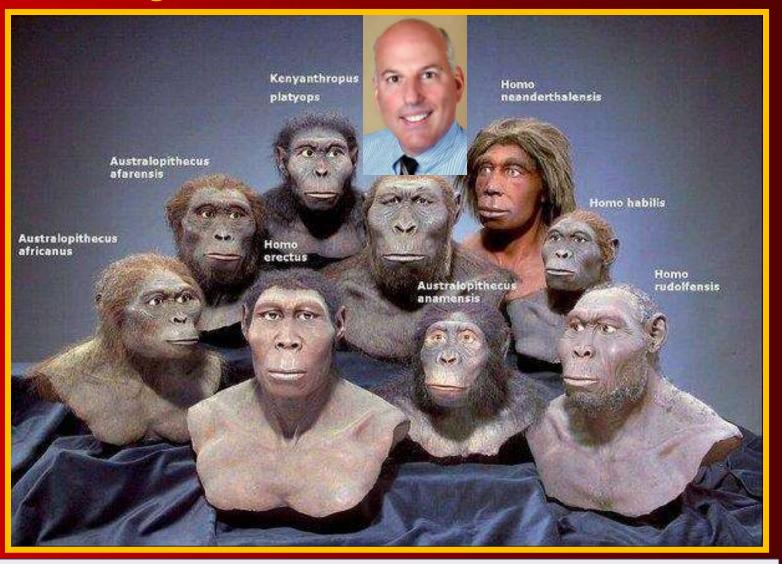
Conflict of Interest Declaration

No financial support or sponsorship received associated with this presentation by speaker nor speaker's business affiliates and family.





Airway Evolution.....



No mouth breathers- so what happened?

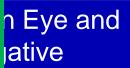


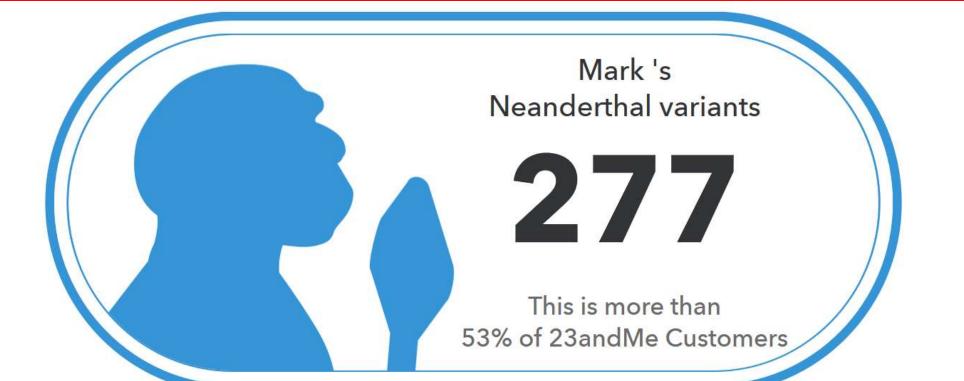
Airway/Facial Evolution

The theory of evolution constructed by **Charles** Darwin is believed by the majority of the academic society. The theory consists of two main points: "All life on Earth is connected and related to each other"; the diversity of life that is seen in the current world is a product of the "modifications of population by natural selection, where some traits were favored in specific environments over others".

Airway Evolution....







You have more Neanderthal variants than 53% of 23andMe customers. However, your Neanderthal ancestry accounts for less than 4% of your overall DNA.

Elizabeth Warren is Whiter than Ivory Soap



99.9% White



99.44% Pure 9.8%

59.4%

14.8%

2.4%

0.7%

0.1%

10.8%

0.9%

0.7%

0.2%

0.2%

Science MAAAS

nite skin

eam found a different picture in ological site in southern They also had a third gene, light skin and blond hair. ue-eyed, but those of central ese genes might have been tion genes is to maximize Ivania State University (Penn ting. People living in northern so natural selection has t absorbs UV more gars and vitamin D naturally

Airway Evolution

- Nasal development
 - Nares width
 - Length of honker
- Pharyngeal development
 - -Standing upright, humidifying and speech
- Oral development
 - Mouth width and length
 - Tongue placement
 - Diet



Airway Evolution

·Nasal development -Climate and the airway



Nasal Char

Investigating the ca adaptation

Arslan A. Zaidi , Brooke C. Mattern,

Published: March 16, 2017 • https://do

 We find that width of temperature and abs humidity. We conclu shape may indeed adaptation to clima simplified explanatio history, which possib forces such as sexu



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Evolutionary Malocclusion

American Journal of PHYSICAL ANTHROPOLOGY



The Official Journal of the American Association of Physical Anthropologists

Research Article

Climate-related variation of the human nasal cavity

Marlijn L. Noback X., Katerina Harvati, Fred Spoor

First published: 09 June 2011 | https://doi.org/10.1002/ajpa.21523 | Cited by: 70

 Variation in nasal cavity shape is correlated with a cline from cold–dry climates to hot–humid climates, with a separate temperature and vapor pressure effect. The bony nasal cavity appears mostly associated with temperature, and the nasopharynx with humidity.

Evolutionary Malocclusion/Airway



Evc

Publ

 Treatment of biomechanic consequence human airwa and evolution



The th Curved airway and small nose.

Airway Evolution



 Does the angle of the airway matter that much?



Hypothesis (e.g.,

nents. Redrawn following

cacy. Regions of the cranium found to fit a neutral model of evolutionary expectation better than the baseline are highlighted in blue. The remainder of the cranium (in white) was found to depart from neutrality relative to the entire cranium.

riews Sciences

> ranial cts

gions of the a neutral allowing for adaptation . Taking an vledge esponse to



Birt

Covaria stature obstetr

Barbara Fisch
PNAS May 5, 2019

humans have evolution circumference that patterns contributed large head, which head, possess accommodated increased risk inlet, which is



shape,

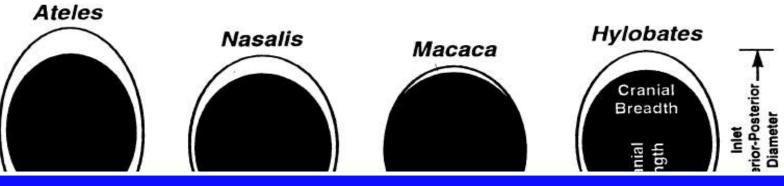


rg/10.1073/pnas.1420325112

be, stature, and head ied covariance

Females with a large better emales with an sess a rounder



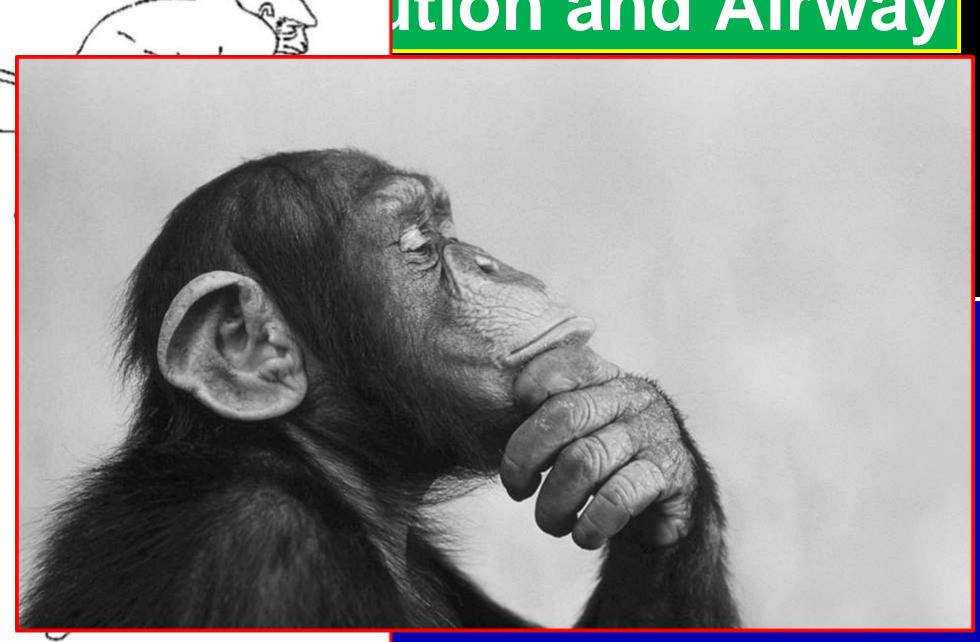


By 100,000 years ago our ancestors had evolved essentially modern brain size and pelvic morphology. It can thus be concluded that these archaic humans probably gave birth much as modern humans do, but also in the behaviour associated with birth (i.e. obligate midwifery).



Ition and Airway

 In summ primate body ger response shoulder usually e human b





"Hooters"- Human Noses

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NewScientist

Technology Space Physics Health Environment Mind | Travel Live Jobs

Home | News | Humans | Life

















DAILY NEWS 24 March 2016

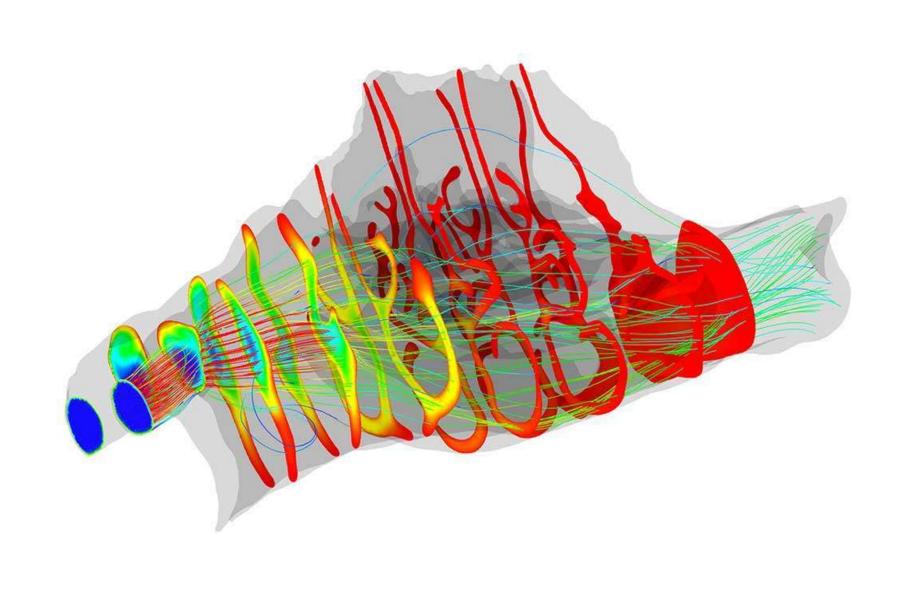
The evolution of the nose: why is the human hooter so big?

It's an evolutionary mystery that's literally as plain as the nose on your face. Why did our ancestors develop a prominent protruding nose when most primates have flat nasal openings?



Long pharyngeal region

 Scans of the nonchimpanzees inhaled air thro passages of content of the content o



Airway Evolution

- Oral development
 - -Diet and speech,
 - -Airway

—?





Evolutionary Malocclusion

American Anthropologist

Free Access

Phonetic Ability and Related Anatomy of the Newborn and Adult Human, Neanderthal Man, and the Chimpanzee

PHILIP LIEBERMAN, EDMUND S. CRELIN, DENNIS H. KLATT

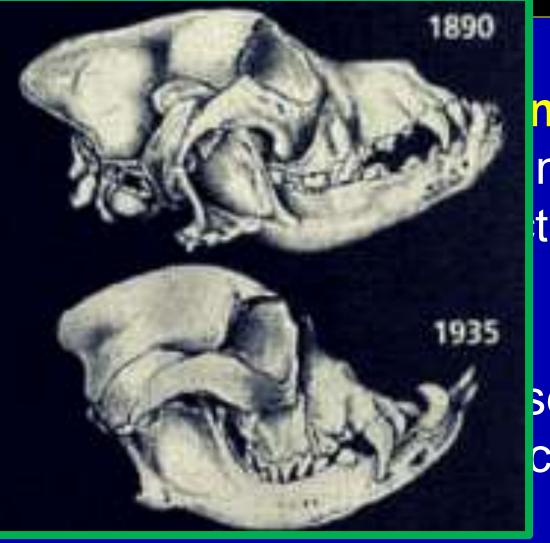
First published: June 1972 | https://doi.org/10.1525/aa.1972.74.3.02a00020 | Cited by: 177

On bulldogs and humans

Man and microevolution- breeding, sexual selection

Most interv proce the B many <u>Cesa</u> becor dogs canal





ng ng t. As

> e C

"Canary" CPAP







- How would ever have <u>survived as a species if we always</u> needed <u>positive pressure oxygen</u> to survive?? Animals who need <u>CPAP?</u>
- Additionally, how <u>would we have survived</u> as a species if males had E.D. ?
- Something does not make "logical" sense.



Erectile Dysfunction

Vasculature. 2017 May 10:1-7.

Erectile dysfunction - overview from a cardiovascular perspective. Baumann F, Hehli D, Makaloski V, Schumacher M, Schönhofen H, Diehm N.

Erectile of problem male por value for diseases risk factor



Explore this journal >

male por Chronic inhibition of nitric-oxide synthase induces hypertension and erectile dysfunction in the rat that value for is not reversed by sildenafil

Serap Gur, Philip J. Kadowitz, Levent Gurkan, Surabhi Chandra, Sharon Y. DeWitt, Andrew Harbin, Suresh C. Sikka, Krishna C. Agrawal, Wayne J.G. Hellstrom

Take Home- airway!



- Airway problem due to adaptations for speech, diet, and possibly microbiome shifts
- Immune and lymph





Emes et al.

On The

Bull Int Assoc Paleodont. 2011;5(1):37-47.

Table 1 List of the extinct hominin taxa

Possible and probable primitive hominins Adipithecus. Ramidus (5.7–4.5 Ma)

Archaic hominins

- -Australopithecus anamensis (4.2-3.9 Ma)
- -Australopithecus afarensis (4.0-3.0 Ma)
- -Australopithecus bahrelghazali (3.5-3.0 Ma)
- -Australopithecus africanus (3.0-2.4 Ma)

Megadont archaic hominins

Evolution

REVIEW

ind Teeth: A Review

erhat Yalcin (2) •

The jaw last cor Homo honestpoliticiansis the current

form. Many factors processing of food evolution course. It is related to other a and bipedal posture the formation of spe

Transitional hominins

- -Homo habilis (2.4-1.6 Ma)
- -Homo rudolfensis (2.4-1.6 Ma)

Pre-modern Homo

- -Homo ergaster (1.9-1.5 Ma)
- Homo erectus (1.8-0.2 Ma)
- Homo antecessor(0.7-0.5 Ma)
- -Homo heidelbergensis (0.6-0.1 Ma)
- -Homo neanderthalensis (0.2–0.03)

Anatomically modern humans

-Homo sapiens (0.19 Ma- present)

en and the
ve effected this
asticatory complex
uch as brain size
nt proceedings like



Human Evolution

Emes et al.

REVIEW

On The Evolution of Human Jaws and Teeth: A Review

Bull Int Assoc Paleodont. 2011;5(1):37-47.

· Yusuf Emes (1), Buket Aybar (2), Serhat Yalcin (2) ·

Reduction in the jaws and teeth of human populations have been previously reported in early Holocene populations from various regions. This reduction was linked to transition from hunter gatherer community to a fully Neolithic (agriculturist) community by some authors. When compared to the whole human evolution, these changes in the human masticatory complex have occurred in a very short period of time.

Take Home- airway!

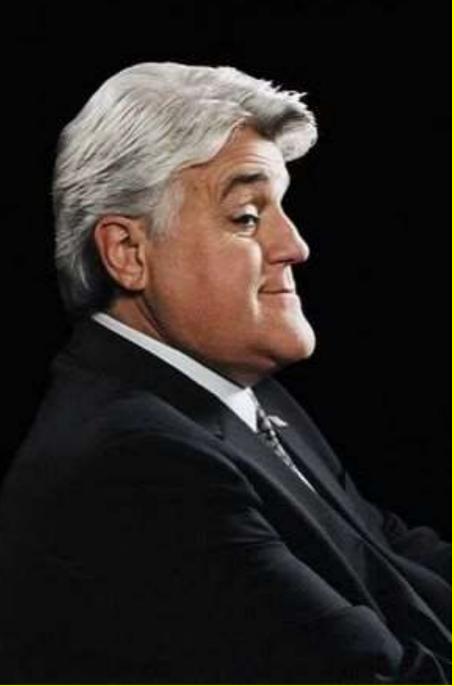


 Airway has been a developing "problem" for a long time- first beginning in **Neolithic period**





Overall, homo sapiens are uspecies among hominids whomodern human beings skull is apparent as the modern homodern human beir



ental



PMCID: PMC3632223

PMID: 23137161

nans: a closer in the symphyseal bone, ertion sites

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(1954) and

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Evolution and Airway

Shir on k disc

Charles L. N

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EVOLUTION, MEDICINE, & JBLIC HEALTH

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ancestor or the great apest numans, orangutans, gorillas, chimpanzees and bonobos all build platforms (or 'nests') upon which to sleep.



Orthodontics vol. 26 no. 2 ety 2004; all rights reserved.

ille, France

onquests"

ayer was Gallic Julius es lasted **52 BC, in** public -

De Bello Gallico

from



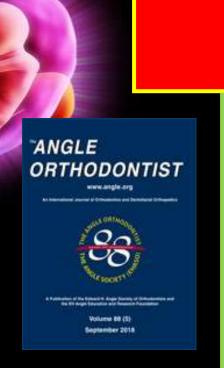
Evolutionary Maloccusion

• Eur J Orthod. 1994 Jun;16(3):163-73.

A comparison of medieval and modern dentitions.

Harper C.

The dentitions of 23 skulls, mostly excavated from a 'plague pit' dating from 1348, were investigated using a Reflex Metrograph. The measurements obtained were compared with those from a modern control sample. It was found that in the medieval dentitions the arch widths were significantly wider, arch lengths and tooth lengths smaller, and the degree of irregularity of the teeth was greater than a modern group.



Evolutionary Maloccusion

- Transverse Dental and Dental Arch Depth Dimensions in the Mixed Dentition in a Skeletal Sample from the 14th to the 19th Century and Norwegian Children and Norwegian Sami Children of Today
- Rune Lindsten, DDSa, Björn Ögaard, Odont Dr, DDSb, Erik Larsson, Odont Dr, DDSc, and Krister Bjerklin, Odont Dr, DDSc

The mandibular intercanine distance was smaller in the skulls compared with the modern groups. The transverse intermaxillary difference between the molars was larger in the skull group than in the 1980s Oslo group. The difference between the maxillary and mandibular intercanine distances was larger in the skulls compared with the modern groups



A cephalometric comparison of skulls from the fourteenth, sixteenth and

trirontiath aantira

Rapid Changes!!!!

Lateral cephalometric radiograms were obtained from skulls of three groups of subjects: 30 skulls were from the remains of those who died in the London Black Death epidemic of 1348, 54 skulls were recovered from the wreck of the Mary Rose which sank in 1545 and 31 skulls were representative of modern cephalometric values. Cranial vault measurements were significantly higher (P=0.000) in the twentieth century skulls, especially in the anterior cranial fossa. Results suggest that our medieval ancestors had more prominent faces and smaller cranial vaults than modern man.

Evolutionary Maloccusion

European Journal of Orthodontics 19 (1997) 355-359

© 1997 European Orthodontic Society

Secular trends in malocclusion in Austrian men

F. J. Weiland*, E. Jonke and H. P. Bantleon

Departments of Orthodontics, *University Dental School, Graz and University Dental School, Vienna, Austria

Diet!

Microbiome changes! Immune mediated airway changes!

n the skulls PAR Index. sion scores The results

ncept <mark>usion</mark> oly due

In concertainty
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 has ocerto the concertainty

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Take Home- airway!

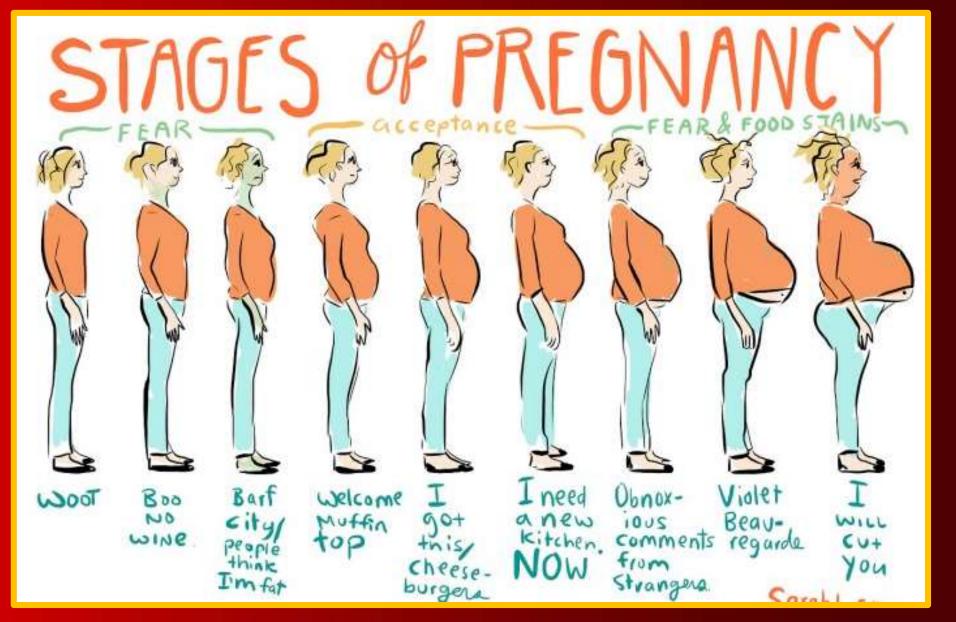


- Evolutionary changesadaptations to climate, diet, mobility, and speech. ARE NOT STOPPING!
- What is OUR FUTURE?





Normal Vaginal Delivery





Fetal Development



yet situated in their final anatomical location.



The birth process...

Normal
 Spontaneous
 Vaginal Delivery

versus

Caesarean Section



The

patho

mate

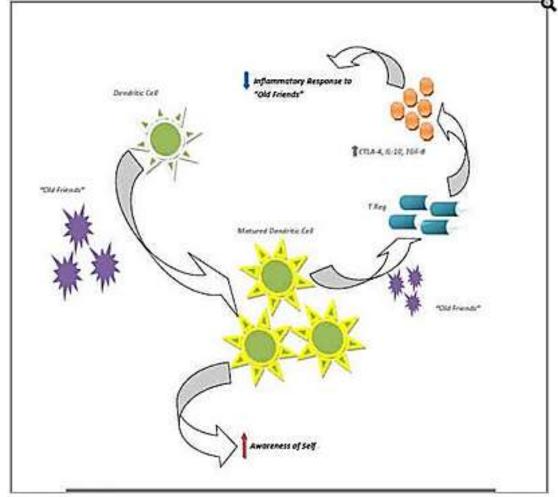
of va

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Table 1

Cesarean Delivery Associated Childhood Diseases 1,2	
Allergic Rhinitis	
All Cesareans	1.37 (1.14-1.63)
Repeat Cesareans Only	1.78 (1.34-2.37)
Asthma	
All Cesareans	1.24 (1.01-1.53)
Female	1.53 (1.10-2.10)
Female & Repeat Cesarean $\frac{3}{2}$	1.83 (1.13-2.97)
Celiac Disease	1.80 (1.13-2.88)
Diabetes Mellitus (Type 1)	1.19 (1.04-1.36)
Gastroenteritis ⁴	1.31 (1.24-1.38)
Gastroenteritis AND Asthma	1.74 (1.36-2.23)





"The Old Friends Hypothesis"

ion differences with differing

modes of delivery seems to be taking the hygiene hypothesis to an entirely new level.

of

5

Normal Infant Respiration

Human infants are commonly described as obligate nasal breathers as they prefer breathing through their nose rather than mouth. Most infants, however, are able to breathe through their mouth if their nose is blocked. The infant initially attempts to breathe through the nose, and is unable to; hypercapnia occurs, and many babies instinctively begin to cry. While crying, oral ventilation occur sides.

Clin Pediatr (Phila).
 nasal breathers? Ber

infants really obligatory



Normal Infant Respiration

Minerva Pediatr. 2010 Oct;62(5):499-505.

Nasal obstruction in neonates and infants.

Chirico G¹, Beccagutti F.

Author information

¹Department of Neonatology and NICU, Spedali Civili, Brescia, Italy.

Immune mediated causes

• The main functions of the nasal airway are respiration and olfaction. The nose and sinuses condition air before reaching the lower respiratory tract by providing almost 100% humidification, warming, filtering and trapping of foreign particles. Any alteration of this clearance system may produce significant problems, particularly in neonates, who are obligate nasal breathers until they are at least two months old. Most cases of nasal obstruction in neonates and infants are due to generalized nasal airway obstruction associated with neonatal rhinitis, viral upper respiratory tract infections, and possibly milk/soy allergies.

Normal Child Respiration

Minerva Pediatr. 2014 Dec;66(6):549-57.

Nasal congestion in infants and children: a literature review on efficacy and safety of non-pharmacological treatments.

Chirico G1, Quartarone G, Mallefet P.

Author information

¹Department of Neonatology and

The most common causes infants and children are in allergies. In neonates and infections (URTI) are frequ obstruction. The use of is to relief nasal congestion it is a safe and valuable t the use of medications (a antibiotics, corticosteroi



quartarone@novartis.com.

ny nose in gin, or y tract es of nasal e solutions widespread; n reduce nt, URTIS.



The environment we are born into...





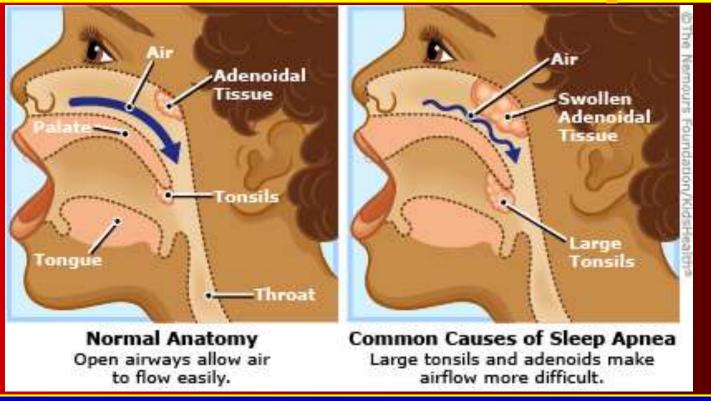
Environmental Influences

Babies crawl on carpet....





Normal Child Respiration



 But what if you don't have normal respiration? What about Obstructive Sleep Apnea?

Cardiac Disease and OSA

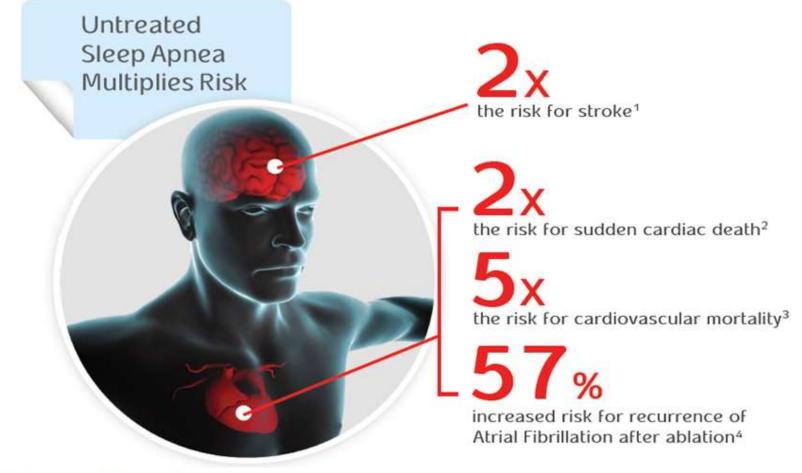
Curr Opi

ROLE DISEA

Ken Mon Assistant South, Me 2437

Susan Re Peter C F Medicine, Medical C 5859, Fax

- Summary—
- OSA and cardioval contributes to or risk reduction. Whi



Sources

- 1) Redline et al, The Sleep Heart Health Study. Am J Res and Crit Care Med 2010;
- 2) Gami et al, J Am Coll Cardiol 2013:
- 3) Young et al, J Sleep 2008;
- 4) Li et al, Europace 2014

disease, it also underscores a need for well powered clinical trials to examine the role of CPAP and other therapies in these populations



International Journal of **Pediatric**Otorhinolaryngology

Growth failure and sleep disordered breathing: A review of the literature

ORAL DISEASES





Children are different!

daytime problematic behaviors in children

M Tachibana, T Kato M, K Kato-Nishimura, S Matsuzawa, I Mohri, M Taniike

- Growth Failure
- Sleep Bruxism, Behavior Issues and Sleep Apnea
- Obesity and failure at school



Pediatric Sleep Apnea

Otolaryngol Clin North Am. 2016 Dec;49(6):1449-1464. doi: 10.1016/j.otc.2016.07.001.

Pediatric Obstructive Sleep Apnea.

Ehsan Z1, Ishman SL2.

Author information

¹Division of Pulmonary Medicine, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, MLC 2021, Cincinnati, OH 45229, USA.
²Division of Pulmonary Medicine, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, MLC 2021, Cincinnati, OH 45229, USA;
Division of Pediatric Otolaryngology - Head & Neck Surgery, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, MLC 2018,
Cincinnati, OH 45229, USA; University of Cincinnati School of Medicine, Department of Otolaryngology - Head & Neck Surgery, 231 Albert Sabin Way, MSB 6503, Cincinnati, Ohio 45267-0528, USA. Electronic address: stacey.ishman@cchmc.org.

Screening for obstructive sleep apnea (OSA) with in-laboratory polysomnography is recommended for children with sleep disordered breathing. Adenotonsillectomy is the first-line therapy for pediatric OSA, although intranasal steroids and montelukast (Singulair) can be considered for those with mild OSA and continuous positive airway pressure for those with moderate to severe OSA awaiting surgery, poor surgical

candidates or persistent OSA. Weight loss and oral appliance therapy are also useful. A multi-modality approach to diagnosis and treatment is preferred.



Int J Pediatr Otorhinolaryngol. 2015 Aug;79(8):1213-7. doi: 10.1016/j.ijporl.2015.05.015. Epub 2015 May 27.

Effect of adenotonsillectomy on ADHD symptoms of children with adenotonsillar hypertrophy and sleep disordered breathing.

Amiri S1, AbdollahiFakhim S2, Lotfi A3, Bayazian G4, Sohrabpour M5, Hemmatjoo T6.

Study of AT and ADHD due to sleep apnea

- BACKGROUND:
- Adenotonsillar hypertrophy is the most common etiologic agent for the obstruction of the upper airways in children, which might be associated with attention-deficit hyperactivity disorder (ADHD),

one of the most common psychiatric disorders of childhood. Despite the concurrence of these two conditions, i.e., obstruction of the airways and ADHD, no exact etiologic relationship has been established between adenotonsillectomy (AT) and ADHD symptoms. This study was undertaken to evaluate the effect of AT on the ADHD symptoms in children with adenotonsillar hypertrophy and sleep disordered breathing (SDB).



Int J Pediatr Otorhinolaryngol. 2015 Aug;79(8):1213-7. doi: 10.1016/j.ijporl.2015.05.015. Epub 2015 May 27.

Effect of adenotonsillectomy on ADHD symptoms of children with adenotonsillar hypertrophy and sleep disordered breathing.

Amiri S1, AbdollahiFakhim S2, Lotfi A3, Bayazian G4, Sohrabpour M5, Hemmatjoo T6.

53 children aged 3-12 with ADHD and AdenoTonsillar hypertrophy

METHODS:

The design of the present study consisted of pre-test and post-test, followed by post hoc tests. Fifty-three children aged 3-12 were included in this study The scores of ADHD symptoms were evaluated before AT and at 3- and 6-month postoperative intervals based on Conner's Parent Rating Scale-Revised (CPRS-R) Questionnaire. Repeated-measures ANOVA and Fisher's exact test were used for data analysis.



Int J Pediatr Otorhinolaryngol. 2015 Aug;79(8):1213-7. doi: 10.1016/j.ijporl.2015.05.015. Epub 2015 May 27.

Effect of adenotonsillectomy on ADHD symptoms of children with adenotonsillar hypertrophy and sleep disordered breathing.

Amiri S1, AbdollahiFakhim S2, Lotfi A3, Bayazian G4, Sohrabpour M5, Hemmatjoo T6.

Sleep Disordered Breathing associated with ADHD treated successfully with AT

RESULTS:

AT resulted in a significant decrease in the severity of ADHD symptoms (oppositional behavior, cognitive disorders, inattention, hyperactivity and ADHD index) at 3- and 6-month postoperative intervals (P<0.001), with more significant decreases at 6-month postoperative interval compared to 3-month interval (P<0.001).

CONCLUSIONS:

Based on the results of this pilot study, AT in children with SDB associated with ADHD resulted in a significant decrease in the severity of ADHD symptoms.



Pediatric Sleep Apnea

Int J Pediatr Otorhinolaryngol. 2013 Oct;77(10):1775-81. doi: 10.1016/j.ijporl.2013.08.020. Epub 2013 Aug 28.

Psychiatric disorders and symptoms severity in patients with adenotonsillar hypertrophy before and after adenotonsillectomy.

Soylu E1, Soylu N, Yıldırım YS, Sakallıoğlu Ö, Polat C, Orhan I.

A number of references, studies....

J Craniofac Surg. 2013 May;24(3):731-4. doi: 10.1097/SCS.0b013e31828011ea.

Evaluation of hyperactivity, attention deficit, and impulsivity before and after adenoidectomy/adenotonsillectomy surgery.

Ayral M1, Baylan MY, Kinis V, Bez Y, Bakir S, Ozbay M, Yorgancilar E, Gun R, Topcu I.

Int J Pediatr Otorhinolaryngol. 2013 Jul;77(7):1094-8. doi: 10.1016/j.ijporl.2013.04.005. Epub 2013 May 2.

The prevelance of psichiatric symptoms in preschool children with adenotonsillar hypertrophy.

Soylu E¹, Soylu N, Yıldırım YS, Polat C, Sakallıoğlu O.







Facial profile and maxillary width- always exam thoroughly

Take Home- airway!



- Early diagnosis
- ENT evaluation
- Sleep study
- AT if indicated





Objectives: It has been hypothesized that permay be presented due to sleep respiratory of the possible exhibit of attention deficit disor (ADHD). The relationship between pediatric sleunknown. The objective of this study is to estim ADHD.

Results: P-SR where positive related to



hat Sleep apnea and ADHD uxism in children individually, pisodes. There is a slight relation further studied.

randolos vinors anaryzoa by z



Pediatric Sleep Apnea

Let's check the internet for recommendations...

- Approach Considerations. Adenotonsillectomy. ...
- Positive-Pressure Ventilation. An important distinction must be made between continuous positive airway pressure (CPAP) and bilevel (or biphasic) positive airway

Shop for treatment for pediatric sle... on Google



Pixi™ Pediatric Nasal CPAP ... \$119.00 DirectHomeM.

Free shipping



PureSom Ruby

\$19.95 DirectHomeM... Free shipping



Mirage Kidsta Pediatric ...

\$99.00 CPAP.com





Softcap - Child Blue Mesh ... \$31.00

EasyBreathe....

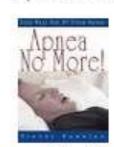


Philips Respironics ...

\$149.00

Respshop
Free shipping

Sponsored @



Apnea No More

\$3.82 Google Play

Adenotonsillectomy.



American Journal of Respiratory and Critical Care Medicine

American Thoracic Society

Am J Respir Crit Care Med. 2012 May 1; 185(9): 998-1003.

Effects of Positive Airway Pressure Therapy on Neurobehavioral Outcomes in Children with Obstructive Sleep Apnea

Carole L. Marcus, Jerilynn Radcliffe, [...], and Lisa J. Meltzer

Conclusions: These results indicate that, despite suboptimal adherence use, there was significant improvement in neurobehavioral function in children after 3 months of positive airway pressure therapy, even in developmentally delayed children. The implications for improved family, social, and school function are substantial.



Pediatric Sleep Apnea



 What good is CPAP? What good is "behavior management"? Or Psychotropic drugs? IF the airway is totally blocked?



Treatment: Team Work

- Consultations:
- Pediatrician
 - Information sharing
- ENT
 - -AT
 - Deviated septum
 - Turbinates
- Pediatric Dentist
 - Expanders
 - Nasal sprays
 - Probiotics

Why should we get involved? What is the prevalence? What can we do?



Pretty easy to use- signification to airway status



The Mallampati Score

Canadian Anaesthetists' Society Journal July 1985, Volume 32, Issue 4, pp 429–434

A clinical sign to predict difficult tracheal intubation; a prospective study.

Mallampati, S.R., Gatt, S.P., Gugino, L.D. et al. Can Anaesth Soc J (1985) 32: 429.



Mallampati Score

Journal of Clinical Sleep Medicine

Official Publication of the American Academy of Sleep Medicine

Mallampati Score and Pediatric Obstructive Sleep Apnea

http://dx.doi.org/10.5664/jcsm.4032

Harsha Vardhan Madan Kumar, M.D.1; James W. Schroeder, M.D.2; Zhang Gang, Ph.D.3; Stephen H. Sheldon, D.O., F.A.A.S.M.4

¹Department of Pediatrics, Division of Allergy and Pulmonary Medicine, University of Illinois at Chicago, Chicago, IL; ²Department of Surgery, Division of Pediatric Otolaryngology, Ann & Robert H. Lurie Children's Hospital of Chicago, Department of Otolaryngology, Feinberg School of Medicine, Northwestern University, Chicago, IL; ³Department of Biostatistics, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, IL; ⁴Department of Pediatrics, Division of Sleep Medicine, Ann & Robert H. Lurie Children's Hospital of Chicago, Department of Pediatrics, Northwestern University, Feinberg School of Medicine, Chicago, IL

A significant correlation was found between Mallampati score, tonsillar size, and AHL. For every point increase in the Mallampati score, the odds ratio of having OSA increased by more than 6-fold. For every point increase in tonsillar size, the odds ratio of having OSA increased by more than 2-fold.

Mallampati score and tonsillar size are independent predictors of OSA. Oral examination including Mallampati score and tonsillar size should be considered when evaluating a patient for OSA. They can be used to prioritize children who may need PSG (Sleep study).

Tol

Original Investigation

The Reliabi

Divjot S. Kumar, BSc; Diann Jeffrey P. Ludemann, MD, F Jane Lea, MD, FRCSC; Neil I



Surgically removed tonsils



Tonsils hidden within tonsil pillars



Tonsils extending to the pillars

• The Brodsky interobserver a compared with scales. The reuniform use of and research v





4
Tonsils extend to midline

Iren

urgery





Prev Chronic Dis. 2016; 13: E121.

Published online 2016 Sep 1. doi: 10.5888/pcd13.160144

Peer Reviewed

Promoting Sleep Health Among Families of Young Children in Head Start: Protocol for a Social-Ecological Approach

Karen A. Bonuck, PhD, Marthur Blank, PhD, Barbara True-Felt, MD, MS, and Ronald Chervin, MD, MS

Inadequate or periodic and increases of prevalence of sand sleep-disoris 20% to 50%.
 prevent behavior breathing sympt



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PMCID: PMC5008861

Published online 2014 Nov 6. doi: 10.1016/j.jpeds.2014.11.001

Sleep-Disordered Breathing, Sleep Duration, and Childhood Overweight: A Longitudinal Cohort Study

Karen Bonuck, PhD, 1 Ronald D. Chervin, MD, MS, 2 and Laura D Howe, PhD 3,4

 Results Children with the children, had inc CI= 1.04-4.17), 10 (OR= 2.25, 95% C Similarly, shor associated wit SDB. Children were more like



J Pediatr. 2015 Mar; 166(3): 632-639.

Published online 2014 Nov 6. doi: 10.1016/j.jpeds.2014.11.001

Sleep-Disordered Breathing, Sleep Duration, and Childhood Overweight: A Longitudinal Cohort Study

Karen Bonuck, PhD, 1 Ronald D. Chervin, MD, MS, 2 and Laura D Howe, PhD 3,4

- Conclusion
- Both SDB and short sleep duration significantly and independently increase children's odds of becoming overweight.



Antibiotics and Proton Pump Inhibitors, Obesity and OSA

Gut microbiota

ORIGINAL ARTICLE

Antibiotic and acid-suppression medications during early childhood are associated with obesity

Christopher M Stark, 1,2 Apryl Susi,3 Jill Emerick,2,3 Cade M Nylund2,3

Antibiotics, acid suppressants and the combination of multiple medications in the first 2 years of life are associated with a diagnosis of **childhood obesity**. Microbiota-altering medications administered in early childhood may influence weight gain.





DEFICIAL JOURNAL

Pediatrics. 2012 Apr; 129(4): e857-e865.

doi: 10.1542/peds.2011-1402

Sleep-Disordered Breathing Outcomes at 4 and 7 Years

Karen Bonuck, PhD, Ma Katherine Freeman, Dr

• RESULTS:

The SDB clusters pre odds of problematic



CONCLUSIONS:

Findings suggest that SDB symptoms may require attention as early as the <u>first year of</u>

Take Home- airway!



 Age One visit- Airway evaluation very important

- Question parents as to snoring and behavior
- Examine the profile
- Family history and Allergies





SIDS- and pacifiers- AAP

- In 2005- Pediatricians recommending "save your child's life"
- "Therefore, we recommend that pacifiers be offered to infants as a potential method to reduce the risk of SIDS. The pacifier should be offered to the infant when being placed for all sleep episodes, including daytime naps and nighttime sleeps. This is a US Preventive Services Task Force level B strength of recommendation based on the consistency of findings and the likelihood that the beneficial effects will outweigh any potential negative effects. In consideration of potential adverse effects, we recommend pacifier use for infants up to 1 year of age, which includes the peak ages for SIDS risk and the period in which the infant's need for sucking is highest. For breastfed infants, pacifiers should be introduced after breastfeeding has been well established".

Pediatrics

November 2005, VOLUME 116 / ISSUE 5

Do Pacifiers Reduce the Risk of Sudden Infant Death Syndrome? A Meta-analysis

Fern R. Hauck, Olanrewaju O. Omojokun, Mir S. Siadaty



SIDS- and pacifiers- AAP

- -SIDS babies may not have been able to use a pacifier to begin with!
- -Positioning is more important.
- -Sleeping with parent, breastfeeding, all factors had to be considered.
- -What are the long term effects of pacifiers? Skeletal changes, adenotonsillar syndr hypertrophy?

Infan

Kim Psaila M, Jann P Foster, Neil Pulbrook, Heather E Jeffery

First published: 5 April 2017



SIDS- and breastfeeding

CONCLUSIONS: Breastfeeding is protective
against SIDS, and this effect is stronger when
breastfeeding is exclusive. The recommendation to
breastfeed infants should be included with other
SIDS risk-reduction messages to both reduce the risk
of SIDS and promote breastfeeding for its many other
infant and maternal health benefits.

Pediatrics
July 2011, VOLUME 128 / ISSUE 1

Breastfeeding and Reduced Risk of Sudden Infant Death Syndrome: A Meta-analysis

Fern R. Hauck, John M. D. Thompson, Kawai O. Tanabe, Rachel Y. Moon, Mechtild M. Vennemann

Pacifiers and Infections





Sinéad Han Health Resear

Peter Griffi Primary and In College Londo

https://doi.org

The risk of ear who use a paci response' with



LITTLE THINGS ARE TRADEMARKS OR REGISTERED SCHOENBORN ST., NORTH HILLS, CA 41343. MUN CT., BRAMPTON, ON L6S 6E3. MADE IN CHINA/FA ARM & HAMMER logo and the distinctive trade dreused under license by Munchkin, Inc.

WCKAN 3366

infections

To USE: Pacifier wipes are made with 100% food grade ingredients.

This means anytime your baby's pacifiers, bottles, cups, teethers, toys and more are dropped, you can simply wipe clean and air-dry. Items are now safe to put back in your child's mouth. Pull tab to open lid and peel back seal. Keep lid closed when not in use to keep wipes moist.

Ingredients: Water (Aqua), Sodium Benzoate, Polysorbate 20, Delydroacetic Acid, Potassium Sorbate, Vegetable Glycerin, Discolum EDTA, Aloe Barbadensis, Citric Acid, Sodium Bicarbonate.

CAUTION: This is not a toy. For adult use only. Keep out of reach of children. For external use only. May cause skin or eye irritation. If skin or eye irritation occurs discontinue use. In case of eye contact rinse eyes thoroughly with water. Allow child's item to air-dry before putting back into child's mouth.

Not tested on animals

vous suffit de pa présent porter languette pour couvercle fern

Composition Acide Déhyd

EDTA de Dis Bicarbonate

Bicarbonate sing and Midwifery, King's

ATTEN

uniquemer usage exte yeux. En c de contact l'air! av Non testé

gher in those a 'dose

response' with continual users more at risk than occasional

users.

Pediatrics June 2013, VOLUME 131 / ISSUE 6

Cleaning Pacifiers

Pacifier Cleaning Practices and Risk of Allergy Development

Bill Hesselmar, Fei Sjöberg, Robert Saalman, Nils Åberg, Ingegerd Adlerberth, Agnes E. Wold

Children whose parents "cleaned" their pacifier by sucking it (n = 65) were less likely to have asthma, eczema, and sensitization at 18 months of age than children whose parents did not use this cleaning technique (n = 58). Protection against eczema remained at age 36 months Vaginal delivery and parental pacifier sucking yielded independent and additive protective effects against eczema development. The salivary microbiota differed between children whose parents cleaned their pacifier by sucking it and children whose parents did not use this practice.

Cleaning Pacifiers



Archives of **Disease in Childhood**

Home / Archive / Volume 98, Issue 9

 Pacifier cleaning pract development

Archives of Disease in C Children whose parents clean (n=65) may reduce the risk of the salivary microbiome transf





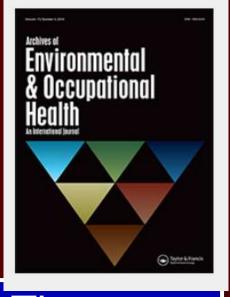
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Pacifiers and nitrosamines

Ingestion of Carcinogenic N-Nitrosamines by Infants and Children

Jerome B. Westin M.D., M.Sc., P.H., Ph.D.

Pages 359-363 | Accepted 28 Jun 1990, Published online: 03 Aug 2010



 Volatile N-nitrosamines are very potent carcinogens. They can be approximately 5 million times more powerful than saccharin. When 16 types of baby-bottle nipples and children's pacifiers were tested recently, relatively high levels of nitramines, nitrosamines, and nitrosatable precursors were found. Infants who use products like those tested may, therefore, be exposed daily to < 100 times more of these carcinogens than are adults.

Household Cleaners and Allergies

EHT Environmental Health and Toxicology

Environ Health Toxicol 2014; 29: e2014017.

For example, a marketplace study of the US showed that nearly half of all commercial soaps contained triclosan (76% of liquid soaps and 29% of bar soaps, a total of 45.5% of all soaps investigated). The popularity of antibacterial consumer products has led to increased consumer use of triclosan. Triclosan and its metabolites were omnipresent in the analyzed plasma and milk of 36 Swedish nursing mothers. The concentrations were higher in both the plasma and milk from mothers who used personal care products containing triclosan than in the plasma and milk from mothers who did not. This result suggested that personal care products were a main source of exposure to triclosan.

current anergie minnus.





Associations between sleep-disordered breathing symptoms and facial and dental morphometry, assessed with screening examinations

Nelly T. Huynh M., Paul D. Morton, Pierre H. Rompré, Athena Papadakis, Claude Remise

In contrast to sleep-disordered breathing or sleep apnea in adults, which is predominantly associated with obesity, sleepdisordered breathing symptoms in this pediatric cohort were primarily associated with adenotonsillar hypertrophy, morphologic features related to a long and narrow face (dolichofacial, high mandibular plane angle, narrow palate, and severe crowding in the maxilla and the mandible), allergies, frequent colds, and habitual mouth breathing.



Chronical
 abnorm
 This dis
 enlarge



multiple anatomic obstructions should also be considered.



Dental arch dimensiona in prepubertal children

Anna Cristina Petraccone Caixeta , Ild Franco, Helena Maria Gonçalves Becker, Be

The mouth-breathing ch larger mandibular width, comparison with the nas clearance, the adenote significant maxillary tracentrol subgroup. The co

rault, a ngth in ray

with the icant

deepening of the palatal height when compared with the adenotonsillectomy subgroup after 1 year.

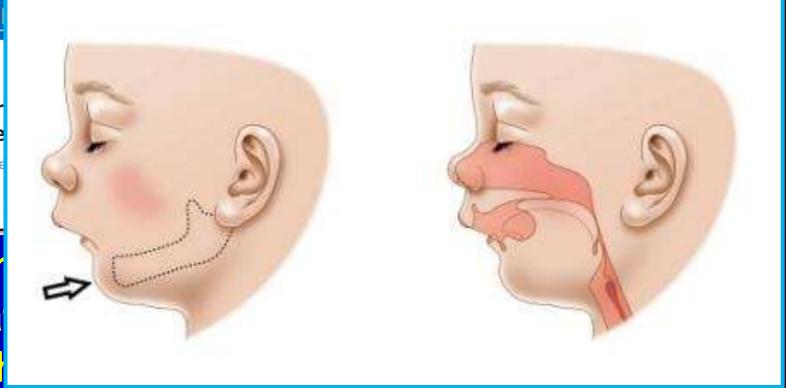
Life Threatening Events



Jole Rabasco PhD, MD, Ale Nicoletta Pietropaoli MD,

First published: 10 May 2016

 In the ALTE group (r habitual mouth brea common (P < 0.05) th



ALTE group also displayed a <u>higher frequency of Angle class</u>
<u>II, narrow palate</u>, <u>and Friedman tongue position (grades III–IV) than the control group.</u>



Association between ora

C. Grippaudo, ¹ E.G. Paolantonio, ¹ G.



AII

Tempore headach

Fernandes

Migraine is the most prevalent pri temporomandibular disorders.

Franco AL, et al. J Orofac Pain. 2010.



• SDB, ADHD, OSA, Obesity, Sleep bruxism, TMD, and Migraines......

- Patien
- -muooral
- ABS MU(TEE

Is obstructive sleep apnea associated with ADHD?

Nagy A. Youssef, MD Margaret Ege, MD Sohair S. Angly, MD Jennifer L. Strauss, PhD Christine E. Marx, MD, MA BACKGROUND: It has been suggested that obstructive sleep apnea (OSA) may result in symptoms similar to those experienced in attention-deficit/ hyperactivity disorder (ADHD). Because this may have important public health implications, we reviewed the literature regarding this association, with a focus on interventional studies examining the effect of OSA treatment on change in ADHD symptoms.

ng

Facial exam

- Do they look and function normally?
- Allergies-MorganDennie Linesand venouspooling



Patient Evaluation

Take Home- airway!



- Early diagnosis
- ENT evaluation
- Sleep study
- Expansion early!



Obstructive Sleep Apnea

Sleep Medicine Center

The Sleep Medicine Center at Lurie Children's is the only comprehensive sleep center in Illinois dedicated solely to children. The center provides clinical evaluation, diagnosis and management of children with all forms of sleep disorders. Sleep disorders treated by our staff include sleep-disordered breathing, sleep apnea, nightmares, insomnia, parasomnias, narcolepsy and circadian rhythm disorders. Since its opening in 1995, the sleep specialists have seen more than 5,000 patients, and more than 14,000 patient studies have been conducted.

male with anterior and posterior crossbites•Maxillary

hypoplasia



The center is directed by Stephen H. Sheldon, DO. Dr. Sheldon is board-certified in both pediatrics and sleep disorders medicine. He has served as a member of the board of directors and was Secretary/Treasurer of the American Academy of Sleep Medicine. He has been a faculty member of the National Sleep Medicine Course (sponsored by the AASM) and is course director of the Advanced Pediatric Sleep Medicine Program of the Atlanta School of Sleep Medicine, Northside Hospital, Atlanta, Georgia.

Darius A. Loghmanee, MD, board-certified in internal medicine, pediatrics and sleep disorders medicine. Since 2008, Dr. Loghmanee has treated patients at Lurie Children's with sleep-disordered breathing, insomnia, parasomnias, narcolepsy, circadian rhythm disorders and other conditions in the spectrum of sleep disorders.

Sleep Study

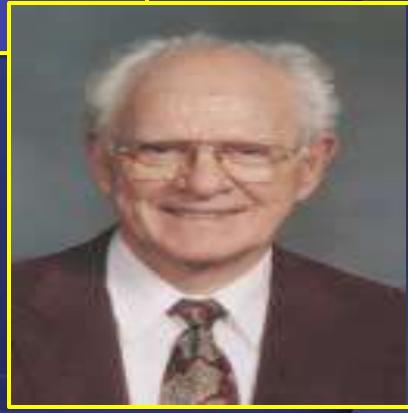
- WilsonQuadhelix for maxillary arch development
- Expand both anterior and posterior segments



Post operative view with <u>upper arch</u> expansion evident

Chair of the combined departments of Pediatric Dentistry and Orthodontics at the new School of Dental Medicine at Southern Illinois University Edwardsville (SIUE), from 1971 until 1987. For 17 years he organized and taught undergraduate Orthodontics and supervised the undergraduate program in Pediatric Dentistry. He also taught clinical orthodontics to the General Practice Residents one day each week in the SIU East St. Louis Dental Clinic. Dr. Sim's widely used text, Minor Tooth Movement in Children was brought out in two editions, 1971 and 1977.

ep



Dr. Joseph Sim

- •Four year old girl with anterior crossbite and prognathic profile
- Patient bites edge to
 edge and slides anteriorly
- •Parents concerned about profile
- No family history of ClassIII relationships
- OSA!! Sleep Study



Interceptive Orthodontics

- •Frontal view in full occlusion- pre-operative photo
- Sleep apnea reported- snoring/ sleep issues
- •Wilson Quadhelix cemented and then expansion



•Child no longer appears prognathic and crossbite corrected, mother quite happy no snoring/OSA





Anterior crossbite with retrognathic profile
Treated with Wilson Quadhelix appliance
Snoring with sleep apnea episodes- ENT "normal"





- Anterior crossbite corrected
- Molars bands left on for one year post treatment
- Arch form restored to normal
- •No snoring!!!



J Clin Sleep Med. Oct 15, 2012; 8(5): 473-476.

Published online Oct 15, 2012. doi: 10.5664/jcsm.2132

PMCID: PMC3459190

PRO: "Not Just Little Adults": AASM Should Require Pediatric Accreditation for Integrated Sleep Medicine Programs Serving Both Children (0-16 years) and Adults

Judith Owens, M.D., M.P.H., F.A.A.S.M., Sanjeev Kothare, M.D., F.A.A.S.M., and Stephen Sheldon, D.O., F.A.A.S.M.

Expansion Appliances



Mixed dentition- airway patient, anterior and posterior expansion

Expansion Appliances



• Expand the posterior but then closing the anterior and retracting?

Take Home- airway!



- Early treatment
- Fixed
 expanders due
 to young age





• ENT, Pediatric Sleep Medicine Center

ORL 35: 19-29 (1973)



Radiocephalometric Analysis

The purpose of the present study was to calculate the average anteroposterior size of the nasopharyngeal airway in 109 children (54 mouth breathers, in whom adenoidectomy was indicated for nasal obstruction, and 55 nose breathers) from 6 to 12 years of age, in order to obtain cephalometric standard; from these standards, one is able to judge the extent to which nose breathing may be obstructed. The results show when planning orthodontic therapy, in which it is desirable to assess the ability of the patient to breath through the nose, a clinical record of the mode of breathing can be supplemented with radiocephalometric data on the anteroposterior size of the nasopharyngeal airway.



• ENT, Pediatric Dentist- Airway Analysis

Abstract

Numerous indices have been proposed alleviate crowding. The purpose of this in McNamara's rule of thumb. Records of pretreatment records. The discrepancy be were correlated against measures of crow (1) males had more significant correlation more strongly correlated than intermolar will width by 2.5 mm to 4.7 mm and 2.7 mm to width by 2.5 mm to 4.3 mm but was reasons potentially overestimate the arch expansis

Key words

Maxilla • Expansion • Pont • Schwarz

Submitted: May 1994

Revise



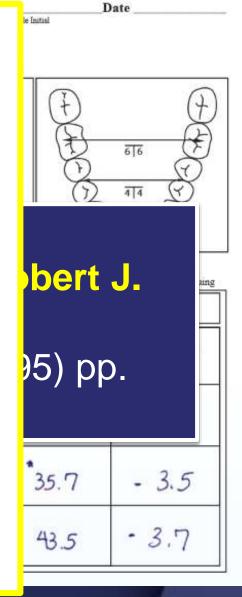


on will be required to hwarz's analysis and om 155 consecutive lex-generated widths nalysis revealed that premolar widths were timated required arch imated interpremolar est that these indices

1995;65(5):321-326.

). 5 1995

321



Take Home- airway!



- Upper and Lower
 Schwarz appliances
- Restore the width
- Requires patient cooperation



Airway- cooperative pre-teen



Snoring but ENT evaluation is WNL's.
 Narrow arches, blocked out upper lateral incisors





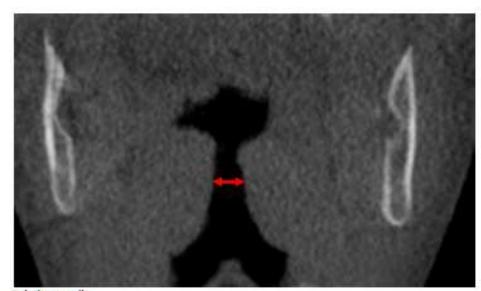
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Typical Airway Patient

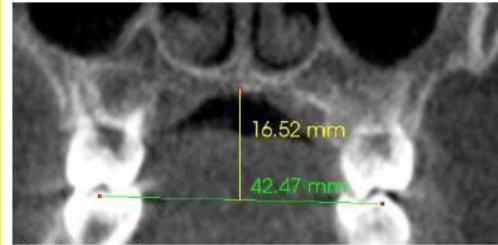




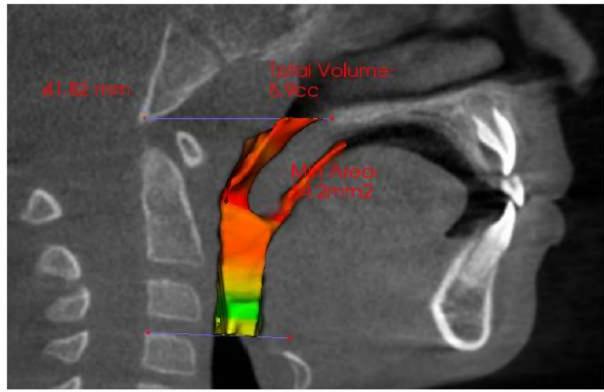
 Would prefer no treatment, but has fan expander for posterior width collapse. Obvious mouth breather, "adenoidal" facies "LFS" or dolichocephalic appearance.



Palatine tonsils



Palatal height index = 39%



Airway Dimensions

CBCT volume alignment for airway analysis.

The hard palate was oriented as horizontal as possible. The ossicles of the inner ear were oriented parallel to each other in the coronal and axial planes for reliability and repeatability purposes. In the sagittal view, parallel lines were made from the level of the posterior nasal spine – basion landmarks, and at the superior most aspect of the body of the C4 vertebrae. The airway was then measured between these parallel markers.

echnology

Diagnosis-Anatomic Airway Analysis





Adenoids



Current Technology

Diagnosis-Anatomic Airway Analysis

Airway: The minimum cross-sectional dimension is ~54 mm.. The accepted minimum cross-sectional airway dimension is ~100 mm². The dimension recorded in the scan is subnormal and puts the patient at risk for obstructive breathing disorders, such as obstructive sleep apnea.

- Adenoids and palatine tonsils: This is a common finding in patients of this age. However, this may contribute to restricted airflow through the nasal cavity, oropharynx, and nasopharynx areas, and may contribute to mouth breathing. Correlate clinically.
- The C1/ramus relationship indicates a possible retrognathic position of the mandible, which may contribute to constriction of the airway.
- Palatal height index: The dimension is subnormal (normal is 42%), and possibly indicates a shallow palate.
- The normal ANB angle is 2° +/- 2. The angle recorded in the scan is above the range of normal, and indicates a possible anteroposterior skeletal discrepancy.
- The remainder of the CBCT scan is unremarkable for any significant abnormalities.

Take Home- airway!



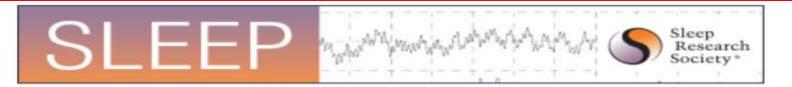
- Early treatment
- Expand to airway- not to "occlusion"
- CBCT analysis







Periodontal Disease and Airway



Sleep. 2015 Aug 1; 38(8): 1195-1203.

Published online 2015 Aug 1. doi: 10.5665/sleep.4890

PMCID: PMC4507724

PMID: 25669183

Periodontitis and Sleep Disordered Breathing in the Hispanic Community Health Study/Study of Latinos

Anne E. Sanders, PhD,¹ Greg K. Essick, DDS, PhD,² James D. Beck, PhD,¹ Jianwen Cai, PhD,³ Shirley Beaver, MS,⁴ Tracy L. Finlayson, PhD,⁵ Phyllis C. Zee, MD,⁶ Jose S. Loredo, MD, MPH,⁷ Alberto R. Ramos, MD, MSPH,⁷ Richard H. Singer, DMD, MS,⁸ Monik C. Jimenez, ScD,⁹ Janice M. Barnhart, MD,¹⁰ and Susan Redline, MD, MPH¹¹

The SDB and periodontitis relationship remained statistically significant, but was attenuated in strength and no longer dose-response. Compared with the nonapneic referent, adjusted odds of severe periodontitis were 40% higher with subclinical SDB (OR = 1.4, 95% CL: 1.0, 1.9), 60% higher with mild SDB (OR = 1.6, 95% CL: 1.1, 2.2) and 50% higher with moderate/severe SDB (OR = 1.5, 95% CL: 1.0, 2.3) demonstrating an independent association between SDB and severe periodontitis.

Video Inspection



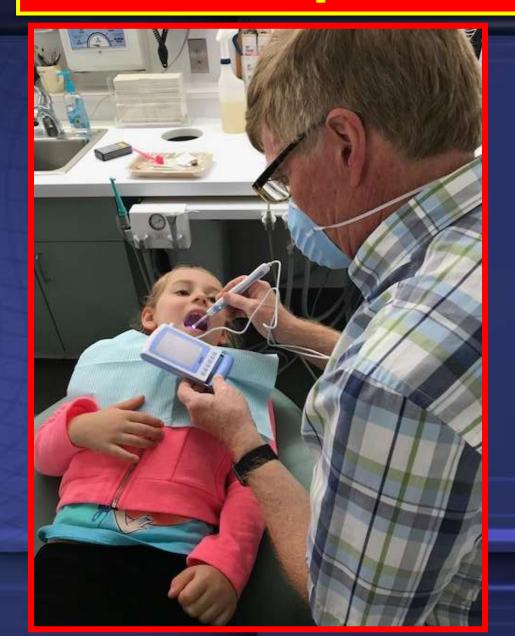
Video inspection- blocked nares, tonsils, turbinates, etc.

Video Inspection





Video Inspection





Clinical Trials- Lurie's and Iowa

Inhaled Xylitol Versus Saline in Stable Subjects With Cystic Fibrosis

This study is ongoing, but not recruiting participants.

Sponsor:

University of Iowa

Collaborators:

Ann & Robert H Lurie Children's Hospital of Chicago Northwestern University

Information provided by (Responsible Party):

Joseph Zabner, University of Iowa

ClinicalTrials.gov Identifier: NCT01355796

First received: May 16, 2011 Last updated: June 4, 2015 Last verified: June 2015

History of Changes



Airway and Polyols

- Sleep Apnea
- Chronic rhinosinusitis
- Cystic fibrosis
- Allergies





Xylitol and chronic "ngsa"

Rhinology. 2016 Jul 10. [Epub ahead of print]

The in vitro effect of xylitol on chronic rhinosinusitis biofilms.

Jain R1, Lee T1, Hardcastle T1, Biswas K1, Radcliff F2, Douglas R1.

Author information

Abstract

INTRODUCTION: Biofilms have been implicated in chronic rhinosinusitis (CRS) and may explain the lim to find more effective, non-antibiotic based therapies for CRS. This study examines the effects of xylitol or

METHODS: Crystal violet assay and spectrophotometry were used to quantify the effects of xylitol (5% at epidermidis, Pseudomonas aeruginosa, and Staphylococcus aureus. The disruption of established biofiln effects on planktonic bacteria growth were investigated and compared to saline and no treatment.

RESULTS: Xylitol 5% and 10% significantly reduced biofilm biomass (S. epidermidis), inhibited biofilm for reduced growth of planktonic bacteria (S. epidermidis, S. aureus, and P. aeruginosa). Xylitol 5% inhibited f effectively than xylitol 10%. Xylitol 10% reduced S. epidermidis planktonic bacteria more effectively than xy disrupted established biofilms of S. aureus when compared with no treatment. No solution was effective a

CONCLUSIONS: Xylitol has variable activity against biofilms and planktonic bacteria in vitro and may hav of CRS.

Xylitol 5% and 10% significantly reduced biofilm biomass (S. epidermidis), inhibited biofilm formation (S. aureus and P. aeruginosa) and reduced growth of planktonic bacteria (S. epidermidis, S. aureus, and P. aeruginosa)







Xylitol in Medicine

Chronic rhinosinusitis: nasal spray

Laryngoscope. 2011 Nov;121(11):2468-72. doi: 10.1002/lary.22176. Epub 2011 Oct 12.

Xylitol nasal irrigation in the management of chronic rhinosinusitis: a pilot study.

Weissman JD1, Fernandez F, Hwang PH.

Author information

¹Department of Otolaryngology-Head and Neck Surgery, Stanford Hospital and Clinics, Stanford, California, USA.

Erratum in

Laryngoscope. 2012 Nov;122(11):2611.

Effective- significant reduction in SNOT-20

Abstract

OBJECTIVES/HYPOTHESIS: To determine the tolerability of xylitol mixed with water as a nasal irrigant and to evaluate whether xylitol nasal irrigation results in symptomatic improvement of subjects with chronic rhinosinusitis.

STUDY DESIGN: A prospective, randomized, double-blinded, controlled crossover pilot study.

METHODS: Twenty subjects were instructed to perform sequential 10-day courses of daily xylitol and saline irrigations in a randomized fashion, with a 3-day washout irrigation rest period at the start of each treatment arm. Collected data included patient characteristics, along with Sino-Nasal Outcome Test 20 (SNOT-20) and Visual Analog Scale (VAS) scores reported at the beginning and end of each irrigation course.

RESULTS: Fifteen of the 20 subjects (75%) returned their SNOT-20 and VAS data for analysis. There was a significant reduction in SNOT-20 score during the xylitol phase of irrigation (mean drop of 2.43 points) as compared to the saline phase (mean increase of 3.93 points), indicating improved sinonasal symptoms (P = .0437). There was no difference in VAS scores. No patient stopped performing the irrigations owing to intolerance of the xylitol, although its sweet taste was not preferred by three subjects (21%). One patient reported transient stinging with xylitol.

CONCLUSIONS: Xylitol in water is a well-tolerated agent for sinonasal irrigation. In the short term, xylitol irrigations result in greater improvement of symptoms of chronic rhinosinusitis as compared to saline irrigation.





Proceedings of the National Academy of Sciences of the United States of America

Proc Natl Acad Sci U S A. 2000 Oct 10; 97(21): 11614-11619.

doi: 10.1073/pnas.97.21.11614

Physiology

The osmolyte xylitol reduces the salt concentration of airway surface liquid and may enhance bacterial killing

Joseph Zabner,*† Michael P. Seiler,* Janice L. Launspach,* Philip H. Karp,* William R. Kearney,‡ Dwight C. Look,§

Jeffrey J. Smith,¶ and Michael J. Welsh**

Author information ► Article notes ► Copyright and License information ►

This article has been cited by other articles in PMC.

ABSTRACT

Xylitol enhances bacterial killing by ASL- antimicrobials

PMCID: PMC17249

The thin layer of airway surface liquid (ASL) contains antimicrooral substances that kill the small numbers of bacteria that are constantly being deposited in the lungs. An increase in ASL salt concentration inhibits the activity of airway antimicrobial factors and may partially explain the pathogenesis of cystic fibrosis (CF). We tested the hypothesis that an osmolyte with a low transepithelial permeability may lower the ASL salt concentration, thereby enhancing innate immunity. We found that the five-carbon sugar xylitol has a low transepithelial permeability, is poorly metabolized by several bacteria, and can lower the ASL salt concentration in both CF and non-CF airway epithelia *in vitro*. Furthermore, in a double-blind, randomized, crossover study, xylitol sprayed for 4 days into each nostril of normal volunteers significantly decreased the number of nasal coagulase-negative *Staphylococcus* compared with saline control. Xylitol may be of value in decreasing ASL salt concentration and enhancing the innate antimicrobial defense at the airway surface.

Take Home- airway!



 Polyols have been reported to reduce inflammation and can improve airway



COME TO NASHVILLE

2019 Registration Begins Now!

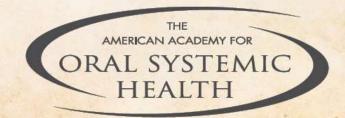
October 17-20, 2019 | Gaylord Opryland Resort | Nashville, TN

Pre-registration special

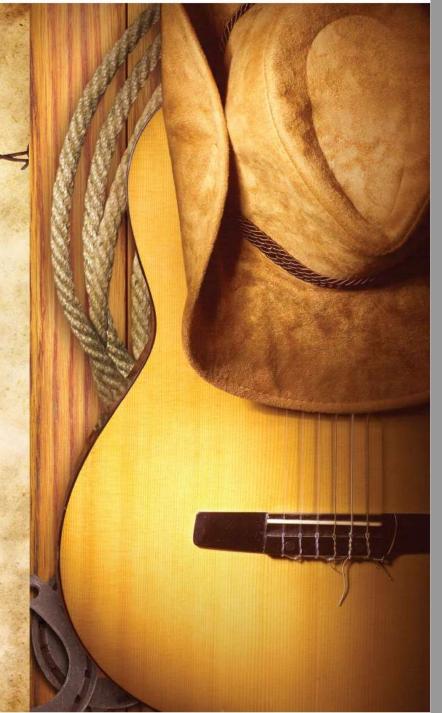
register at the AAOSH table or at AAOSH.org/2019

DDS: \$829* TEAM: \$629*

*Price includes 1 Year Free AAOSH Membership



WODED LEADERS IN PROACTIVE HEALTHCARE COLLARODATION



Finding Conner....

"Finding Connor Deegan."

-Valerie Deegan

