SIDS and Otitis media – an anatomical perspective

Presented by: Brian Palmer, D.D.S., December 2001.

For a better understanding of the presentations, I would recommend you consider printing out these notes (or 'select all', 'copy' and 'paste' into your own word processing program). There are approximately 17 pages in this commentary. Each slide is numbered. The notes will describe the slides in more detail. If you feel this presentation has any value, please pass the website address on to others.

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Click here to open SIDS presentation. (71 slides) 1.9 MB file size

Click here to open Otitis media presentation. (40 slides) 1.91 MB file size

Knowledge is most meaningful when shared with others. This is the reason I am sharing this research with you.

This website is the result of 25+ years of self-funded research. I am the sole manpower. I have however, consulted with many and for whom I give many thanks. I believe my research is unbiased and is the result of walking down many different paths. Some will challenge that my research is not scientifically documented with numbers and calculations. I do not have the time or money to do controlled studies. I believe my research will withstand the test of time. I have done the best that I can; it is now up to others to carry on my research.

In the future, I do plan to put up one final presentation on the importance of breastfeeding to the development of the oral cavity, airway and facial form. Hopefully it will explain the interrelationship of all the presentations and articles on this website.

This presentation addresses SIDS and Otitis media from an anatomical perspective. I would like to dedicate the presentation on SIDS to Dr. Edmund S. Crelin whose work inspired me to develop this presentation. Dr. Crelin, who was a professor of anatomy at Yale for 37 years, has given me permission to share his research. He is now retired. His credentials are listed at the end of this commentary.

As for my credentials: I have been in private dental practice evaluating mouths for 31 years. I have an analytical personality and am always trying to determine why things work or fail, or put in another way - "why things are not naturally correct". I consider genetics only as a last resort. I also have a background in anatomy. I had a tremendous

anatomy professor who made the field of anatomy exciting. I was a human anatomy lab assistant at Kansas University in the 1960's and have probably dissected more cadavers than most physicians. The SIDS presentation is based on Dr. Crelin's research as well as some dissections in which I participated.

For close to 25 years I have researched the field of obstructive sleep apnea (OSA). OSA is a serious medical condition that can be fatal as it can lead to high blood pressure, stroke and falling asleep while driving. I encourage you to view my presentation on OSA on this site. For several years I had a sub-specialty in my dental practice of fabricating oral appliances for the treatment of OSA. I had to step back from fabricating appliances because of the time involved in making them plus the frustration of having to deal with insurance companies over coverage. Time has become very important to me since being diagnosed with cancer and then having my health insurance coverage cancelled. That issue is covered under the topic of "Health Care Crisis" on this site.

<u>WARNING</u>: Some of the pictures in this presentation are of dissections and are quite graphic. The pictures may not be suitable for all to view.

The sudden, unexpected death of an infant, with no apparent cause, is tragic. Many of these cases are certified as sudden infant death syndrome (SIDS). The incidence of SIDS has gradually declined recently, but whenever it happens, it can be devastating for the parents and other family members.

The genesis of health starts before conception with the health of the mother, followed by a healthy environment for the in-utero development of the infant. This presentation on health issues begins with the birth of the child.

To understand SIDS, one must first understand the anatomy and function of the oral cavity and oropharynx (throat). For anyone interested in SIDS, I would encourage you to get Dr. Crelin's book, "The Human Vocal Tract" and his Clinical Symposia booklet, "Development of the Upper Respiratory System". Both are listed in the references at the bottom, along with some of the other articles I recommend.

Following are some quotes from these two books:

"In all adult nonhuman mammals and the human infant, the larynx can be elevated so that the epiglottis slides up behind the soft palate to lock the larynx into the nasopharynx."

"With the soft palate fitted snugly around the larynx that is locked into the nasopharynx, the suckling human newborn infant can breathe while swallowing liquid. The liquid passes through the isthmus faucium to the pharynx on both sides of the elevated larynx." The term used to describe this ability to breathe and swallow at the same time is called "obligate nose breathing."

"This ability of the human newborn to elevate the epiglottis and lock it with the soft palate is what makes the newborn's throat different from that of the adult human and

more like that of all other mammals. All mammals, other than the adult human, are obligate nose breathers."

Key points: "Between two and six years of age, there is a gradual descent of the larynx to a lower position in the neck. ... Along with the descent of the larynx, there is a descent of the posterior part of the tongue, which gradually forms more and more of the anterior wall of the oropharynx. By six years of age, the upper respiratory system has essentially the adult configuration... The posterior third of the tongue is vertically oriented to form the anterior wall of the oropharynx." (Crelin)

SIDS

SLIDE # EXPLANATION

4 - Shows some of Dr. Crelin's credentials

6-11 - Illustrations of the close relationship of the epiglottis to the soft palate in infants. At the age 2-6 months, the larynx starts descending and the tongue starts to form the anterior wall of the pharynx. By age 5, the epiglottis can no longer reach the soft palate - even with maximum elevation. (Crelin) Also note in all slides that the tongue extends out, over, and past the mandible or 'gum pad'. This is the natural resting position of the tongue in all newborns. This forward position of the tongue adapts the newborn for immediate breastfeeding. (Illustrated in slides 39 & 40) The tongue cushions and protects the breast from the hard bony gum pad during breastfeeding. If the tongue is held back from this position (as in a tongue-tied newborn) the gum pad traumatizes the breast and makes it difficult to breastfeed.

10 - This dissection solidified my belief in Dr. Crelin's research. It demonstrates the close proximity of the epiglottis to the soft palate. This relationship allows a newborn to be an 'obligate nose breather'. This relationship is impossible in the adult human. As Dr. Crelin stated - "The tongue is entirely within the oral cavity." This is critical because in the adult, the distalization of the tongue (tongue falls back into the throat during supine sleep due to gravity) is a significant contributor to obstructive sleep apnea (OSA). NASA has shown that micro-gravity decreases sleep disordered breathing because there is less gravitational pull on the tongue in the supine position. In an adult, the distal 1/3 of the tongue is the anterior wall of the oropharynx. It is because of this position the tongue can fall back and obstruct the airway.

Also note the high 'bubble' palate in this slide, and also in slide 7. (Will be explained more in a future presentation). A high palate is a known risk factor for obstructive sleep apnea (OSA) in adults. (See sleep apnea presentation).

Key point: The significance of the above is that it may explain why putting an infant to sleep on its back ('Back To Sleep' campaign) has decreased the incidence of SIDS. In the newborn, before the descent of the epiglottis, the tongue is entirely within the oral cavity and does not drop back and obstruct the airway. Once the epiglottis and tongue descend,

the infant can be at risk for obstruction the same as an adult. By that time however, the arousal ability of the infant may be mature enough for the infant to change position, or at least respond, as does an adult who wakes up sub-consciously and opens the airway (usually with a 'snort'). Any snoring by a young infant indicates there is some type of resistance in the airway and puts that infant at risk for SIDS.

12 - 15 - A visual anatomical explanation of the mechanism involved in obligate nose breathing.

13 - "When the larynx is locked into the nasopharynx, it divides the wide continuation of the oral cavity with the oropharynx, the isthmus faucium, into two channels, one on each side of the larynx ... this is the route taken by swallowed milk in the human newborn infant when the larynx is locked into the nasopharynx ... the air and liquid routes are walled off from each other." (Crelin)

17 - Sagittal view of a Siamese fetus head approximately 6 months old. The epiglottis in not fully developed and therefore is not as elevated as it would be if fully developed.

18 - Coronal dissection of twin of fetus in #17. Slide illustrates the relationship of the structures in the pharynx - from behind. Epiglottis and soft palate are not touching, as they would have if the dissection had been done on the fetus in slide 10.

19 - This slide has been altered (using Photoshop) by elevating the epiglottis to illustrate the interlocking of the epiglottis and soft palate. Channels can be seen on both sides of the interlocking where breastmilk can flow.

20 - This slide has also been altered by elevating the epiglottis a little higher to illustrate the direct link from the nose to the larynx.

21 - Dissection of adult pharynx from behind showing the mature height of the epiglottis.

24 - "The descent of the epiglottis separates humans from all other mammals. This separation causes the pharynx to serve as a common passageway for both inspired air and ingested food ... The fact that the infant larynx is not a miniature of the adult form must be considered when it is intubated. It is because of this descent, however, that allows humans to produce a greater variety of sounds than all the other air-breathing forms. The great number of striated muscles of the neck attached to the skull, mandible, thorax, hyoid bone, and larynx all add to the variations in shape and position the pharynx can assume." (Crelin)

29-34 There are 4,630 species of mammals. The human is only but one of those species. All but the adult <u>human</u> mammal are obligate nose breathers. **Key Point:** Because of this difference, animals cannot be used for sleep apnea research involving the airway. The research results are invalid even before the research begins.

35 - **Key point:** Understanding tongue function and development is critical to understanding breastfeeding, SIDS and obstructive sleep apnea (OSA).

36 - Since the epiglottis is elevated, the tongue is located entirely in the mouth, plus it extends over and past the mandible ('gum pad').

37-38 - Note how the tongue extends over the lower gum pad in the "habitual tongue posture" of the newborn. This is critical to breastfeeding comfort.

39-40 - Humans were created to have their tongues extended over the gum pad at birth to cushion the breast during breastfeeding from the bony gum pad (mandible). Without this cushion, the bony gum pad would traumatize the breast. An example of this occurring is when an infant is tongue-tied and the tongue cannot extend over the gum pad, making it painful for the mother to breastfeed. (See presentation on frenums) Articles by Escott and Woolridge describe the action of the tongue during breastfeeding, beginning by compression of the breast with the tip of the tongue and moving in a peristaltic motion toward the back of the throat. **Key point**: The action of the tongue during breastfeeding is a front-to-back peristaltic motion. The tip of the tongue stays advanced. The tip of the tongue does <u>not</u> move backward to strip the milk from the breast. **Key point**: The breast extends back in the mouth to the approximate junction of the hard and soft palate during breastfeeding (Key point for understanding otitis media as well).

41 - The action of the tongue during breastfeeding is critical for the proper development of an adult swallow (Will be discussed more in a future presentation on oral cavity development). In the adult, the epiglottis and soft palate are not interlocked.

42 - Features to note: Bottle-feeding and pacifier use can drive the tongue distally (back) forcing the separation of the soft palate and epiglottis. Bottle-feeding and pacifiers use can also elevate the soft palate (depending on length) and restrict the area around the eustachian tubes (key to otitis media). If the nipple is firm, it is more effective for the infant to use the gum pad to compress the nipple. It would also be traumatizing to the tongue if it was placed between the gum pad and the firm nipple. The infants adapt to their situation, be it good or bad. Bottles, pacifiers, etc. can also drive the mandible back, or prevent it from advancing properly, due to the fulcrum force from the bottle onto the mandible.

Without the protective feature of obligate nose breathing (due to the separation of the soft palate and epiglottis), the natural breathing process for the newborn becomes more complex, or creates an instability that the infant may not be prepared for, and a SIDS event could occur.

43 - Thumb sucking is quite normal in most cases. In excess, however, it can be as damaging as bottle-feeding and pacifier use.

45 - Illustration in Hickey and Vergo article (See references) demonstrates what can happen when any large foreign object is placed in an infant's mouth - a separation of the soft palate and epiglottis.

46 - In another article by Beckman et al, they state: "SIDS affects a specific, well-defined age group, with most victims aged 1-6 months. About 90 percent are fewer than 25 weeks old; most 2-4 months old."

47 - More articles are now discovering a relationship between SIDS, OSA and facial form.

48 - **Key to one of the causes of SIDS**. During the first 4 to 6 months of life, the infant is an obligate nose breather. In simplistic form, the airway from the nose to the larynx is wide open. It does not take much skill to breathe this way. As the tongue starts falling back into the mouth, and the epiglottis starts to descend, breathing becomes more complex because of the space created between the soft palate and epiglottis. As stated, "this reflects a period of potential respiratory instability." **Key point**: With this separation comes a greater chance the tongue can fall back and obstruct the airway, putting the infant at risk for SIDS. In the adult, the tongue falling back and obstructing the airway is a major cause of OSA.

49 - **Key slide**: The peak incidence of SIDS happens to occur during the same period of time when the natural descent of the epiglottis occurs. The tongue is also moving distally back into the mouth at the same time.

50 - Demonstrates how gravity can block off the airway and cause obstruction. This obstruction can cause many consequences, including OSA and SIDS - along with many side effects (see presentation on sleep apnea).

It is dangerous for most people with OSA to sleep on their backs because of the effect of gravity. The reason for this is that the posterior 1/3 of the adult tongue forms the anterior (front) wall of the oropharynx (throat). During deeper sleeps, an individual loses muscle tone, the muscles positioning the tongue forward become lacks, and gravity pulls the tongue back and can possibly cause an obstruction. Because the adult has a more advanced arousal response, the adult wakes himself up, usually with a "snort". For a very old or feeble individual, the arousal response may not be strong enough to wake the individual up, and that individual may pass on from "natural causes".

This reasoning may not apply to infants under 4 - 6 months because the tongue is advanced and the epiglottis is elevated. It may be the reason why putting a newborn to sleep on his/her back seems to be reducing the incidence of SIDS. As Dr. Crelin stated: "The tongue is located entirely within the oral cavity" until it starts to descend. The tongue does not descend to be part of the oropharynx until the epiglottis descends. The "Back to Sleep" promotion may be the best for the first 4 months of life, but it might be detrimental after that. The key here is that during those beginning 4 months of life, the infant gains time for the maturation of the arousal center in the brain. Once the arousal

center is developed and the infant is strong enough to change positions, the infant should be able to sleep in any position.

51 - Research by NASA demonstrates how important gravity is in sleep disordered breathing.

52 - I do not know much of the story on Dr. Steinschneider and his Apnea Theory of SIDS. He and his theory were criticized for some reason. I believe he was just ahead of his time. I believe Dr. Steinschneider was correct in his position, and his critics set back research on SIDS by two decades. There are many articles being published now that show there is a relationship between SIDS, OSA and facial form.

53 - A very important statement by the AAP: "SIDS may reflect a delayed development of arousal." As stated above, the newborn does not need much breathing skill while he/she is an obligate nose breather. Air flows unobstructed from the nose to the lungs. That skill is developed over time and as the epiglottis starts to descend. By the time there is separation of the soft palate and epiglottis, hopefully the infant has learned to respond if the tongue might happen to fall back and start obstructing the airway. It would seem that the longer an infant was breastfed, the longer he/she would remain an obligate nose breather. Bottle-feeding and pacifiers would have a tendency to cause an early separation of the soft palate and epiglottis.

54 - I do not support the position that there is not enough evidence to demonstrate a protective effect of breastfeeding from SIDS.

55 - A news release by a SIDS association stating that pacifier use may be helpful at reducing SIDS was the main reason for my doing this presentation on SIDS. I believe pacifiers are a major contributing factor to many of the health problems we have today. I will cover this issue in my next presentation on development of the oral cavity, airway and facial form.

56 - It is hard to believe this article was used to support pacifier use instead of breastfeeding.

57 - What are the answers to these questions?

58 - A **modified** version of a pacifier like this might be helpful for an infant at risk for SIDS, but not a common pacifier. A "modified" pacifier with an air tube through the middle with some sort of front piece to prevent the infant from swallowing the appliance might be an option for an infant at risk.

59 - Research out of Stanford states that if an adult has a high palate, narrow dental arches, or a retruded (pushed back) mandible, he is at risk for obstructive sleep apnea. I believe this same formula applies to infants and SIDS. There is a link to this article from the "Links" area.

61 - Craniofacial development begins early in life, especially in the first 4 years. There is a direct link between craniofacial development and SIDS and OSA. All health care providers need to understand the importance of proper development in early life (Covered in OSA presentation as well as next presentation on the development of the oral cavity, airway and facial form).

62 - Prehistoric man rarely had malocclusions. We have a health care crisis today because of our "modern" technology and habits. I have hypothesized that prehistoric man did not have OSA. During that time they may not have had as high an incidence of SIDS either.

63 - Article states that digit and dummy sucking increases the tendency to tongue thrust. I have found a high correlation between tongue thrusting and OSA in the patients I have treated for OSA. I also believe this correlation exists in SIDS as well.

65 - A **high palate** increase the risk of SIDS and OSA because it decreases the space in the nasal chamber (the roof of the mouth is also the floor of the nose), and it narrows the width of the arch, which in turn decreases the space available for the tongue.

A **retruded chin** increases the risk of SIDS and OSA because it drives the tongue back into the throat area. (See slide 28) The tongue is attached to the inside of the lower jaw (mandible), so whenever the mandible is retruded, so is the tongue.

Bottle-feeding (slide 42). The mandible can be a fulcrum point, forcing the mandible distally, or preventing it from advancing forward. During breastfeeding, the coordinated muscle action it takes to produce the complicated act of breastfeeding encourages the proper advancement of the mandible. Bottle-feeding, pacifier use, etc. act as deterrents for advancement because of the distalizing pressure these habits have on the mandible.

66 - This patient has a huge tongue. He has severe sleep apnea. An infant with a large tongue is a big risk factor for SIDS.

67 - **Anything** that obstructs the airway, like these tonsils, puts an individual at risk for SIDS, sleep disordered breathing and OSA.

68 - A CPAP is a possible option for an infant at high risk for SIDS.

In conclusion: I know I will be criticized for not having controlled studies or enough scientific numbers, but being self-funded, this is the best that I can do for the moment. If I could have access to MRIs and do more dissections, I am confident I could compile the needed scientific numbers to verify my statements. That, however, would take outside funding.

For Better Health
Brian Palmer, D.D.S.
Kansas City, Missouri, USA
December 2001

Otitis media - middle ear infections

4 - This presentation covers the anatomical region around the Eustachian tubes (ETs) and the muscles involved with their opening and closing. The names Eustachian tubes and Auditory canals can be interchanged.

5 - It is important to understand the position and angle of the tubes change with age. The lower the tubes are, the easier it is for foreign material to get into them. Position is also important for drainage.

6 - The Tensor veli palatini is the muscle that opens the ETs during swallowing. It is the muscle that fires when you are in an airplane and you have to swallow in order to equalize the pressure in you ears. If you cannot get the muscle to fire properly, you can experience pain. Scuba divers also have to equalize pressure in their ears by doing the same thing while descending to the depths. Infants who cannot equalize the pressure in their ears can experience much pain and discomfort. Result - much crying.

7-8 - **Muscles of the Eustachian tube** (Gray's Anatomy)

Tensor veli palatini: It arises by a flat lamella from the scaphoid fossa at the base of the medial pterygoid plate, from the spina angularis of the sphenoid and from the lateral wall of the cartilage of the auditory tube. It ends in a tendon that winds around the pterygoid hamulus, being retained in this situation by some of the fibers of origin of the Pterygoideus internus. Between the tendon and the hamulus is a small bursa. The tendon then passes medialward and is inserted into the palatine aponeurosis and into the surface behind the transverse ridge on the horizontal part of the palatine bone.

Levator veli palatini: A thick, rounded muscle situated lateral to the choanae. It arises from the under surface of the apex of the petrous part of the temporal bone and from the medial lamina of the cartilage of the auditory tube. It spreads out in the palatine velum, its fibers extending obliquely downward and medialward to the middle line, where they blend with those of the opposite side.

Salpingopharyngeus: Arises from the inferior part of the auditory tube near its orifice; it passes downward and bends with the posterior fasciculus of the Pharyngopalatinus.

13 - Illustrates how a tongue that is pushed back (in this case because of the retruded chin - tongue is attached to the inside of the mandible) can elevate the soft palate and block the opening of the ETs. Circulation of air in the area becomes poor because of the confinement in space. When blocked or clogged and having poor circulation, the area becomes prone to infection. This infection can then advance up the ET to the middle ear.

14-15 - Note position of ETs (red arrows), junction of hard and soft palate (yellow line), path of possible regurgitation into region of ET, and force (black arrow) that if applied,

would force soft palate into the ET and easily obstruct the ET and reduce the chamber space.

Key point: **Chamber size.**

Note the large **size of the chamber** (nasopharynx) in which the ET sits. It is a spacious well ventilated area conducive to a good circulation of air and a healthy environment. If the soft palate was elevated from the pressure of a force (black arrow) such as from the tongue or a long bottle nipple, the space would be compacted, have poor circulation, and have an unhealthy environment. If the infant had a cold or other infection, a congested area would be slower to heal. Example: It would be like comparing the freshness of air circulating in a large palatial ballroom to that in a small dingy and damp closet.

Key point: **Relationship between soft palate and epiglottis.**

During breastfeeding, the breast only goes back to the junction of the hard and soft palate. No unnatural force is placed on the soft palate from a normal sized tongue. The tip of the tongue stays forward as it extends out and over the gum pad. There is no force causing a separation of the soft palate and epiglottis.

During bottle feeding, the nipple, depending on firmness and length, could go back past the junction of the hard and soft palate, and cause a **separation between the epiglottis and soft palate**. A nipple could also force the tongue physically back into the mouth and drive the tongue up against the palate much like that shown in slide 13 and 27.

Two reasons the tongue might be driven back:

1) If the tip of the tongue is left forward as it is during breastfeeding, the tongue could be traumatized during compression by the hard bony mandible or gum pad. It is easier to get the fluid out of a bottle by just biting up and down in a straight up-and-down motion than using the peristaltic motion needed during breastfeeding.

2) The infant might have to draw the tongue back into the throat area in order to protect the throat from an excessive overflow of fluid from the bottle (depending on the size of the hole at the end of the nipple). This protective mechanism is what leads to a tongue thrust. See slide 27. (Covered in presentation on oral cavity development). This is one of the main reasons infants should not be bottle-fed while on their back.

16-17 - Shows how fluid can gain easy access to the area of the ETs (green arrow) once the interlock between the soft palate and epiglottis is forced apart.

18 - Demonstrates the peristaltic motion of the tongue from front-to-back during breastfeeding. This is the precursor for the proper adult swallow shown in slide 19.

19 - **Test yourself**:

Close your eyes and concentrate on what the tongue does when you swallow. During a correct adult swallow, the tip of tongue should stay in contact with the roof of the mouth in the area just behind the upper front teeth. The rest of the tongue should just push up into the roof of the mouth (palate) during the rest of the swallow. You may not notice the peristaltic wave. If you feel any pressure from your tongue into, or between, any of your teeth, you probably do not have an ideal occlusion (bite). (Covered in presentation on the development of the oral cavity). If you have problems swallowing pills, you are probably a tongue thruster.

Near the end of the adult swallow, the Tensor palatini muscle fires and opens the Eustachian tube (reason you have to swallow in airplanes to equalize the pressure in your ear). Both the Levator palatini and Tenor palatini muscles fire to elevate and tense the soft palate. This is necessary to prevent regurgitation of food and water back out through the nose.

20 - By developmental design, these muscles (Tensor and Levator) may not fire in the same manner in the newborn. I hypothesize that the newborn swallow may be different for the first few months because it is not necessary to lift the soft palate during a swallow until the epiglottis begins to descend. During obligate nose breathing the newborn's epiglottis elevates and forms an interlock with the soft palate, allowing the newborn to breathe and swallow at the same time. It is not necessary for the soft palate to elevate and block off the nasopharynx. If it did, it would block off airflow. The newborn was created to be breastfed by its mother - and designed accordingly. The breastmilk flows around the interlock, in the channels developed for this purpose, and down the throat. It is for this reason, I even recommend mothers breastfeed their infant in an upright or prone position, but not while the infant is in a supine position.

21 - The Pterygoid hamulus acts like a pulley in the middle of the path of the Tensor palatini m. Rough example: The fan belt in your car acts around a pulley. If the position of the pulley does not tighten the belt properly, the belt is not effective. The Tensor palatini was designed to tense the muscles of a wide palate. If the palate is narrow (not normal), the Tensor may not fire as well (loose palatal tissue), and because of this, may not open the Eustachian tube as it should. (Hypothesis only)

22 - In nearly all of the 600 prehistoric skulls that I have evaluated, I found a large posterior nasal aperture like this one.

23 - This was the youngest skull (adult) I examined at the Smithsonian. It was from the 1940s. The skull had a high palate, a narrow dental arch, bad teeth, and a small posterior nasal aperture.

24 - Graphic illustration showing how a high palate decreases nasal space and narrows the width of the palate.

27 - Note: The tip of the tongue is driven back into the mouth - distalized tongue separates the interlock of the epiglottis and soft palate - elevated tongue pushes soft palate up and congests area around the Eustachian tube.

It may also be necessary for the infant to retract the tongue back into the mouth during bottle feeding because if it was left advanced, the tongue could be pinched between a firm nipple (firmer than the breast) and the gum pad.

28-32 - Dissection of an adult head from behind, showing position and path of the muscles in the area of the Eustachian tube.

33 - Shows delicate nature of the middle ear.

34 - Pipe cleaner shows path of Tensor palatine around the hamulus.

35 - Research like this shows digit and pacifier use can have a significant damaging impact on the action of the tongue and on occlusion. (Covered in presentation of the development of the oral cavity)

37-38 - Other contributing factors to otitis media.

39 - **Test yourself**. Drink water out of a bottle while lying on your back. Does it affect your swallow? Is it difficult to do?

In summary: To better understand otitis media, I believe the **chamber size around the Eustachian tubes** and the **ability of the Tensor palatine muscles to fire properly** need to be studied further.

In conclusion: Children are our future, give them the best chance for a healthy future. They trust their mothers to do what is best for them. Natural is best. Breastfeeding is the best of nature. If at all possible, please breastfeed your children.

For Better Health
Brian Palmer, D.D.S.
Kansas City, Missouri, USA
December 2001.

Edmund S. Crelin, Ph.D., D.Sc.
Received his doctorate from Yale University
Became a faculty member at Yale in 1951
Professor of anatomy in the department of surgery
Professor in department of orthopedics and rehabilitation
Chairman of Human Growth and Development at Yale
Retired after 37 years of research at Yale
Research mainly involved musculoskeletal system and birth defects

Awards received:
Most outstand teacher at Yale School of Medicine:
- 1961 - F.G. Blake Award
- 1973 & 1980 - Yale Physicians' Associate Program Award
Outstanding research: 1976 - Kappa Delta Award

Author of:
- The Human Vocal Tract: Anatomy, Function, Development, and Evolution
- Anatomy of the Newborn
- Functional Anatomy of the Newborn
- Five CIBA Clinical Symposia on human development
- 168 research articles
CIBA Publications, Clinical Symposia
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Development of the Lower Respiratory System, Vol. 27, No 4, 1975
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