

Infant Dental Decay

Is it related to Breastfeeding ?

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Dental decay on infant teeth is called many different things, including:

- Baby Bottle Tooth Decay (BBTD)
- Infant caries
- Nursing caries
- Bottle mouth syndrome
- Early Childhood Caries (EEC)

Position of the AAPD in 1996

“The risk of potentially devastating nursing- pattern dental decay exists for the breast-fed child as it does for the bottle-fed child”

Pediatric Dentistry, Journal of the American Academy of Pediatric Dentistry (AAPD), Special Issue, Reference Manual, 1995-1996, Vol. 17, No. 6, p25.

Position of the AAPD in 1996

“Ad libitum nocturnal breastfeeding should be avoided after the first primary tooth begins to erupt.”

Pediatric Dentistry, Journal of the American Academy of Pediatric Dentistry (AAPD), Special Issue, Reference Manual, 1995-1996, Vol. 17, No. 6, p25.

Examples of infant decay

Slides courtesy of:

Children's Mercy Hospital, Kansas City, Missouri

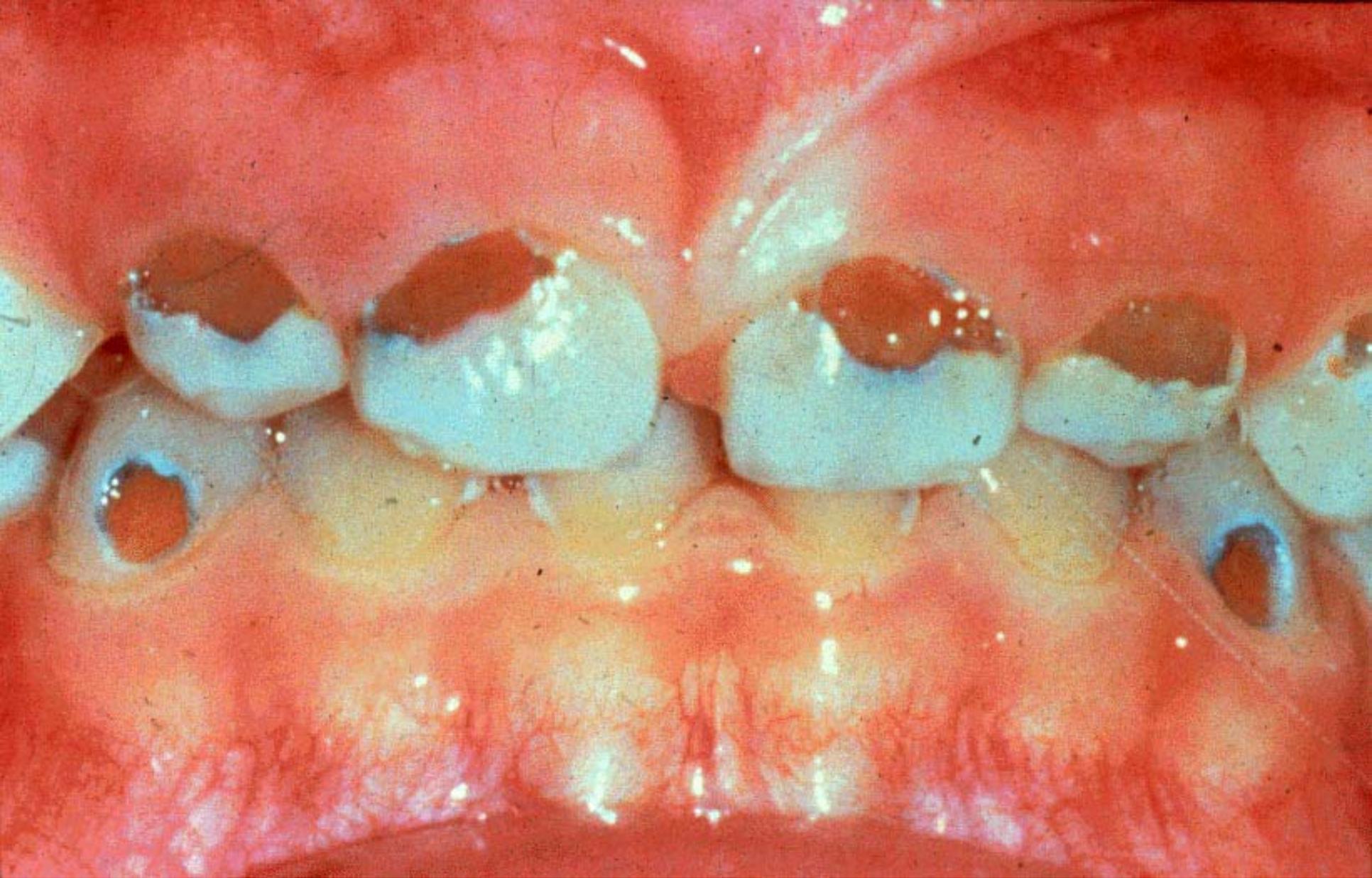
Dr. Howard Cross, Winnipeg Children's Hospital, Manitoba, Canada



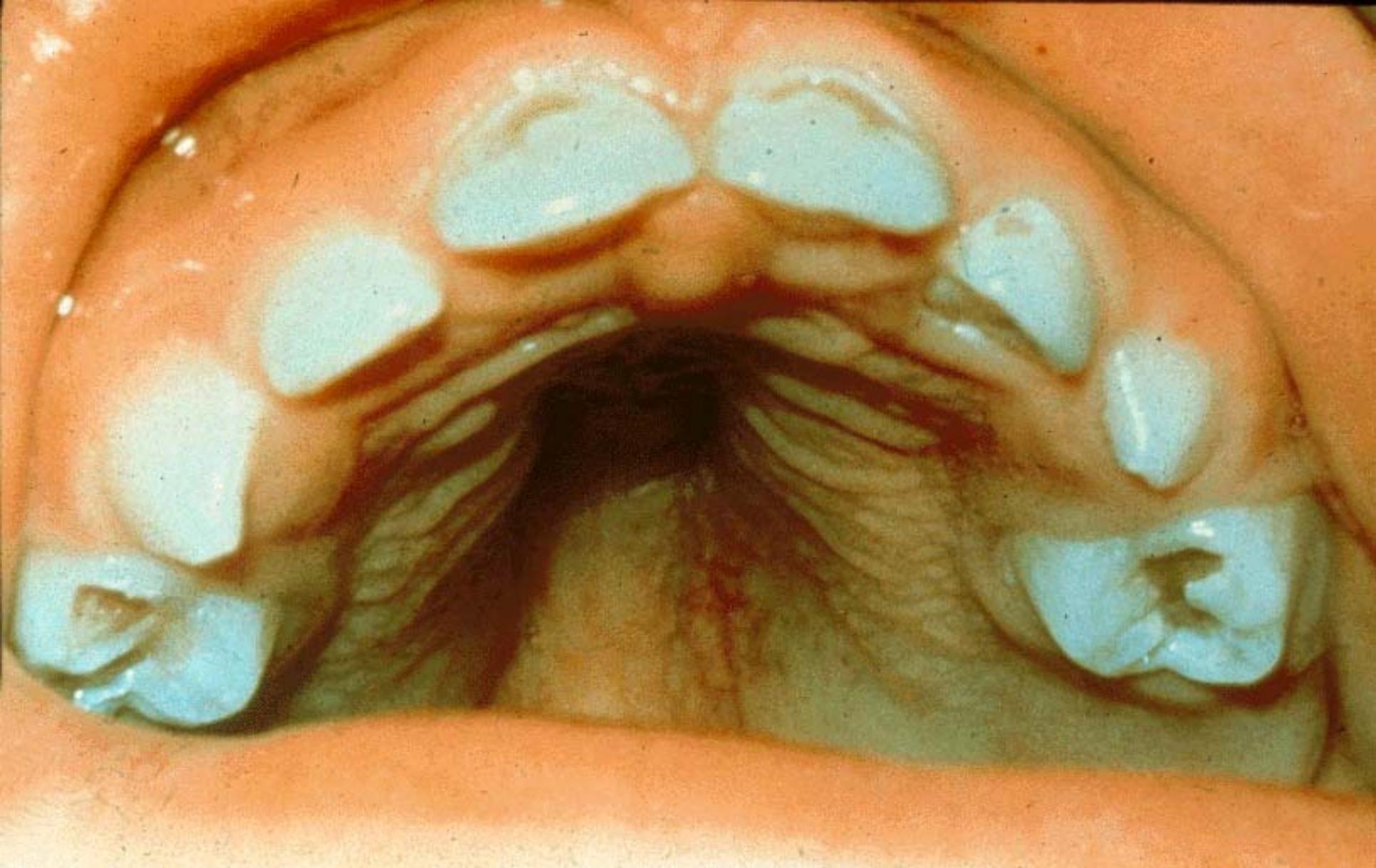
5 BBTD - Note abscess above upper front tooth



6 Baby Bottle Tooth Decay (BBTD)



7 BBTD - lower front teeth least affected



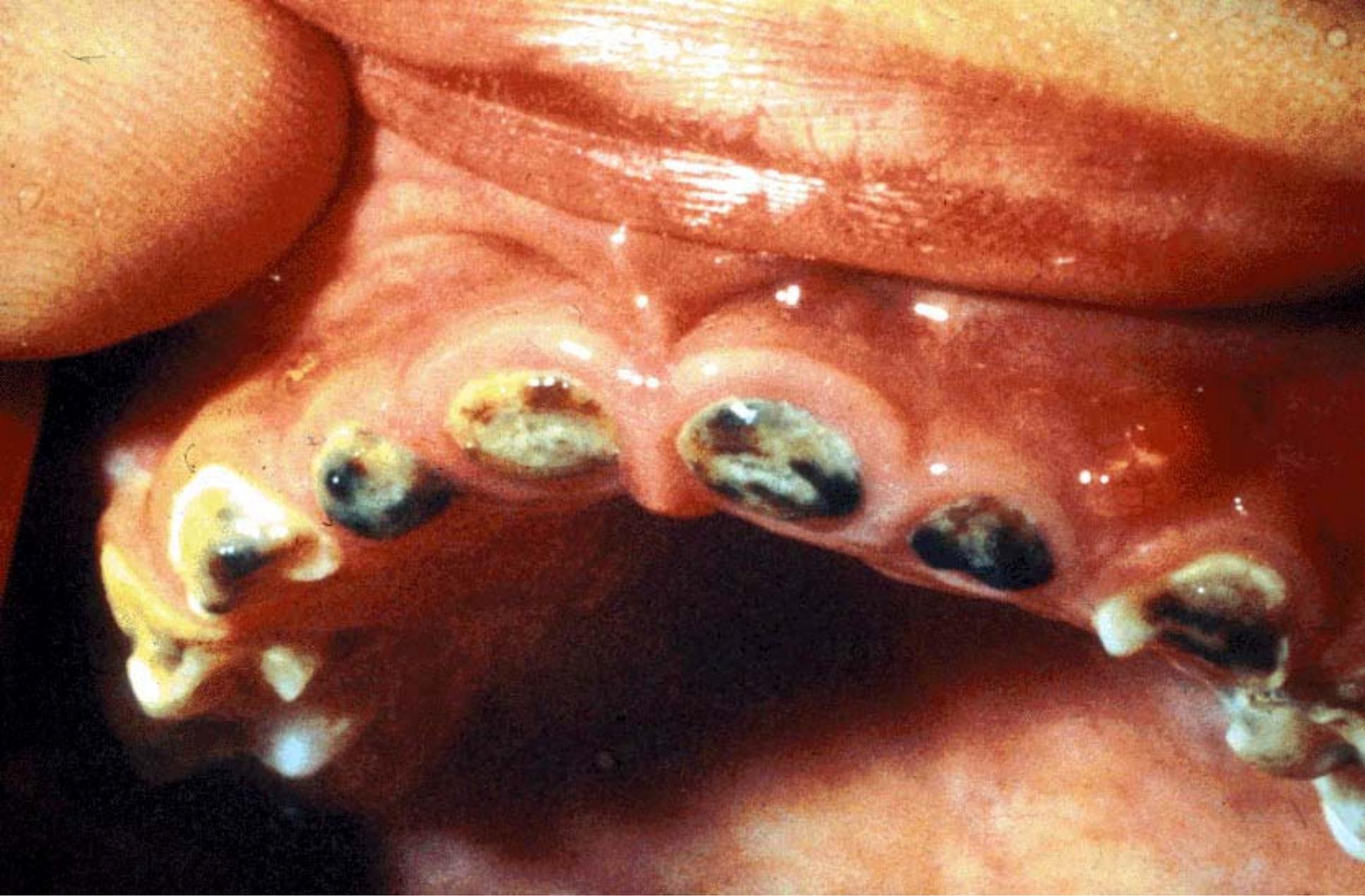
BBTD - also note high palate - could be genetic or it could be from bottle feeding



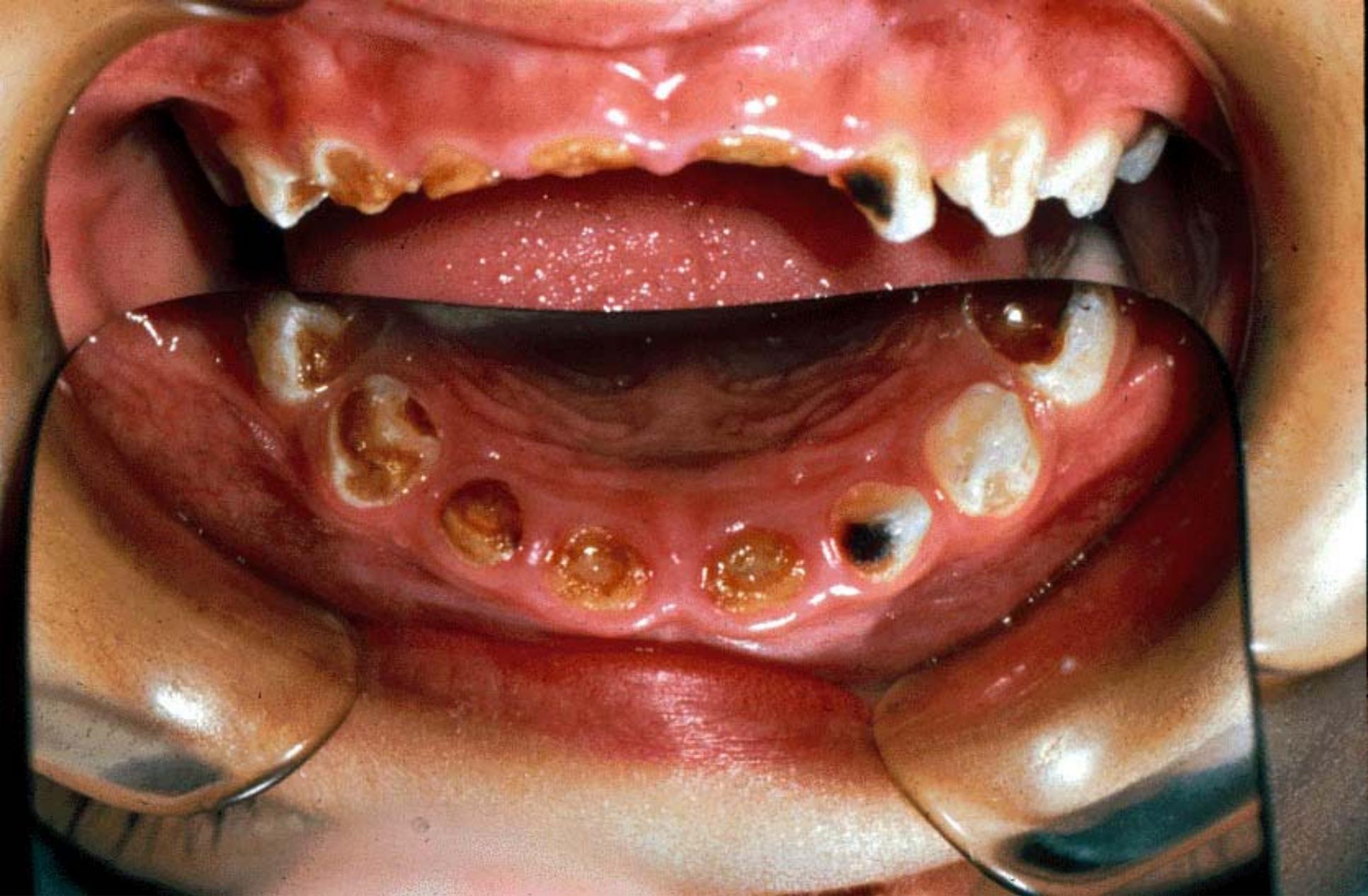
9 BBTD - all remaining teeth have silver crowns



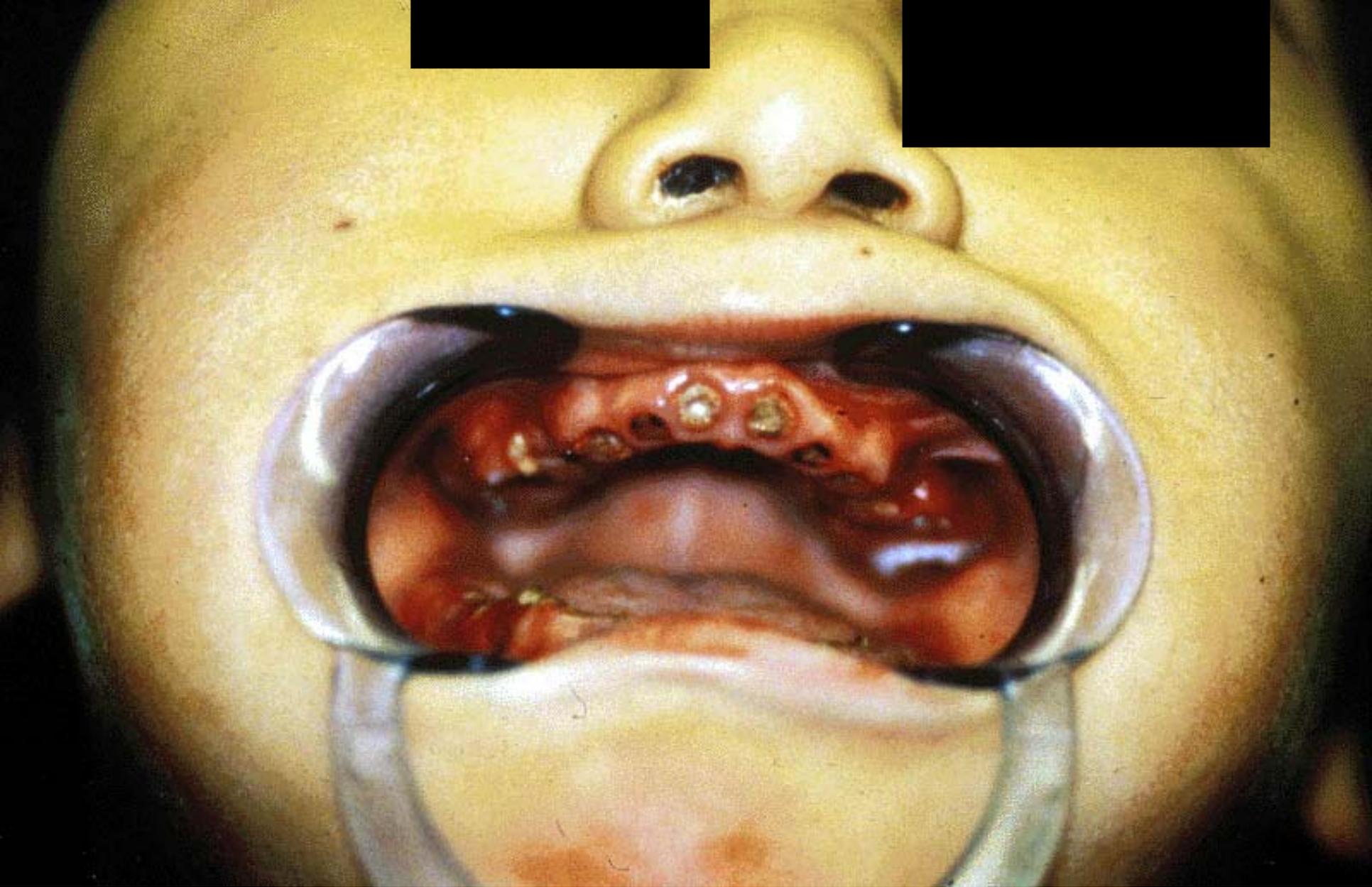
Typically, upper front tooth decay is first to be noticed by the parent.



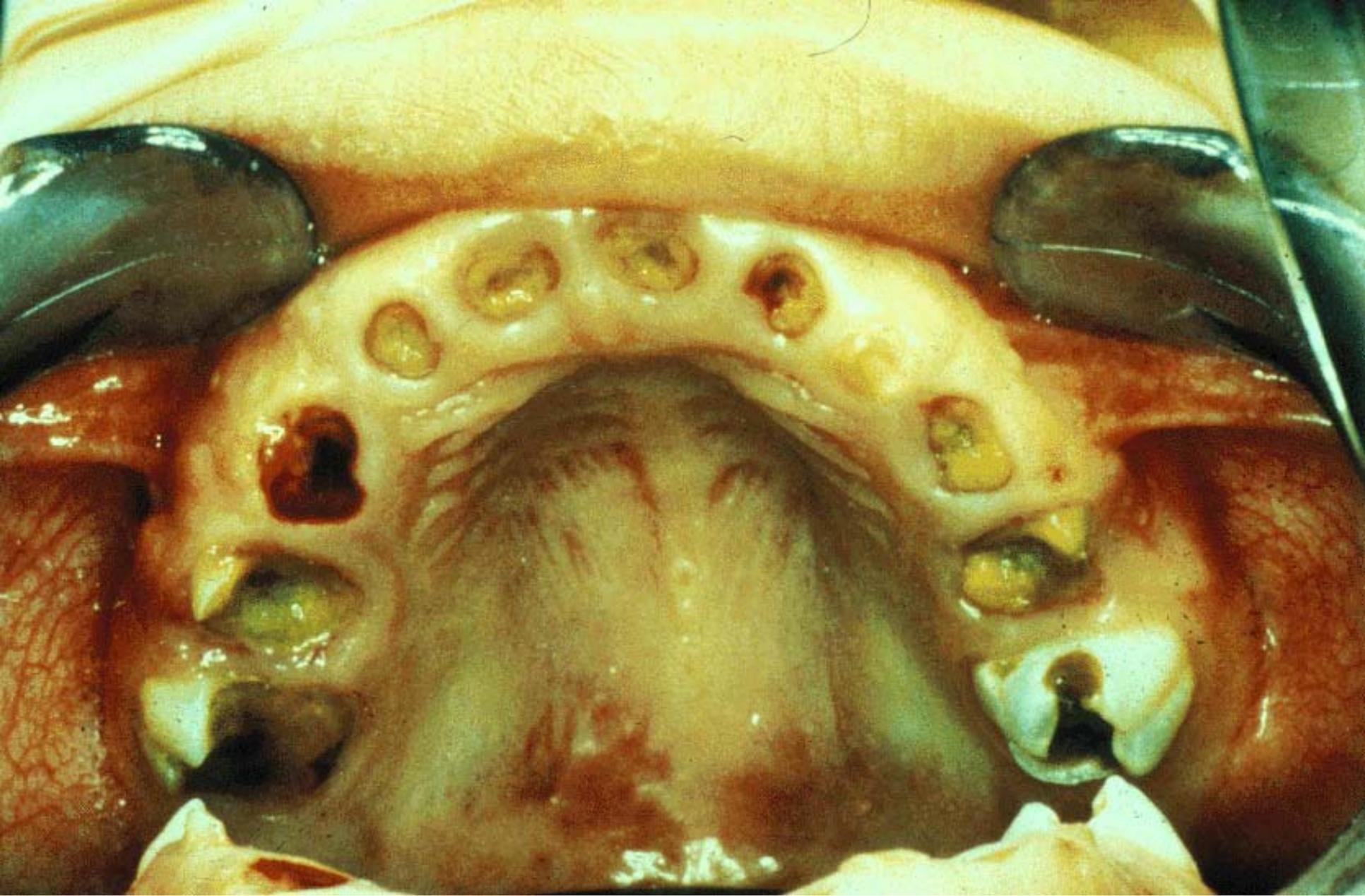
Gross decay



12 Mirror used to reflect & demonstrate decay



Gross decay throughout mouth



Decay from sugar - NOT breastmilk!

“ Early childhood caries is of epidemic proportions in some populations. ”

Tinanoff / O’Sullivan, Early Childhood caries: overview and recent findings, *Pediatr Dent*, 1997:19(1),12-16.

This is a true statement of contemporary times, but **NOT true of prehistoric times.**



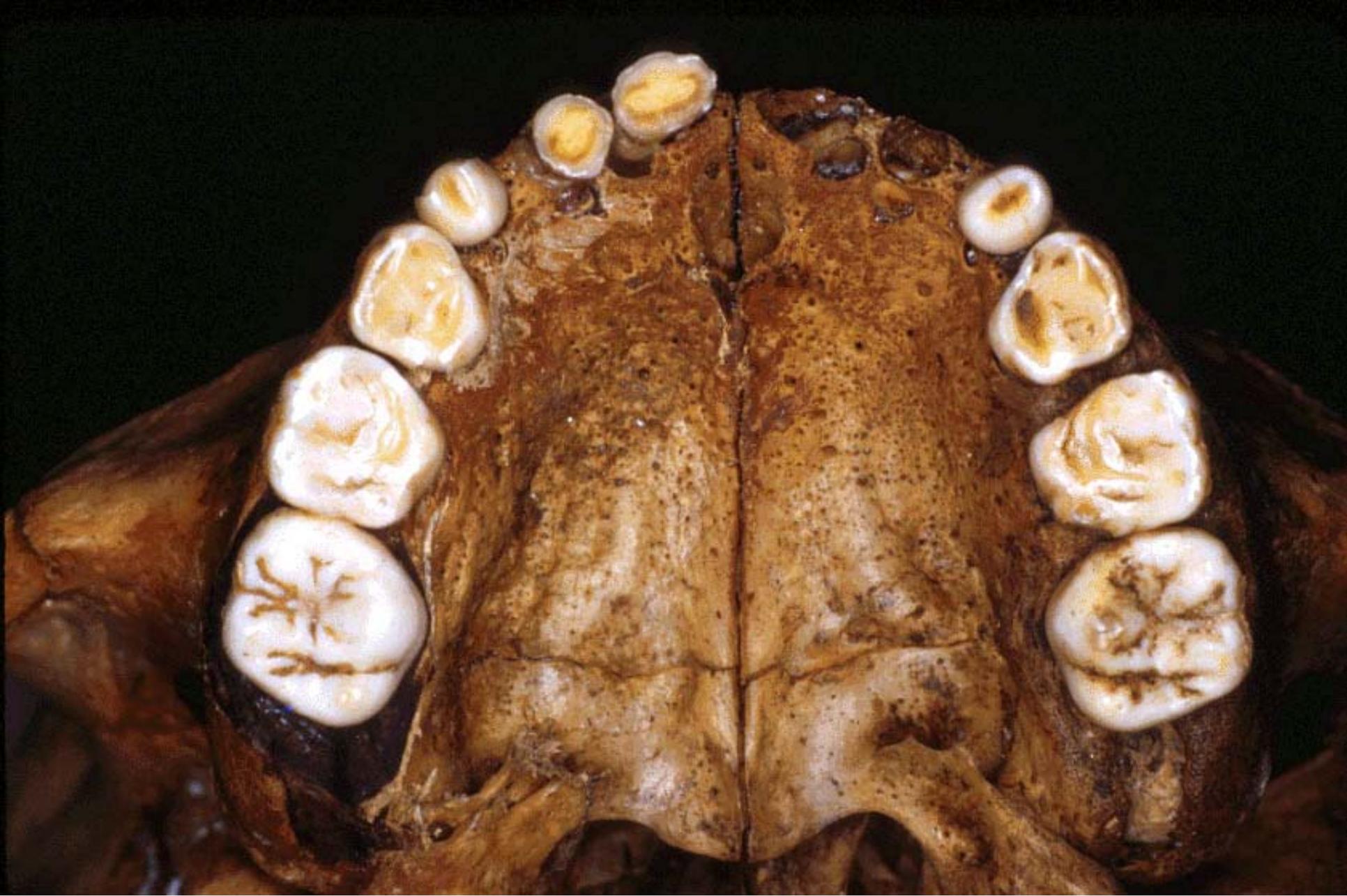
Prehistoric infant skulls
examined at Smithsonian
Natural Museum.



Prehistoric infant skull - no decay



Prehistoric infant skull - no decay



Prehistoric infant skull - no decay





Prehistoric infant skull - no decay

Deciduous Caries Data

Native Americans - mostly Plains of South Dakota

Archaeological content - prehistoric to early historic

Location: Smithsonian Natural Museum, Washington, DC.

Data organized by staff at Smithsonian at request of Dr. Palmer

- Deciduous teeth examined - 1344
- Carious lesions present - 19
- % of teeth having caries - 1.4%
- Number of “large lesions” - 4
- % having “large lesions” - 0.3%

Study of 16 Native American communities: - rate of early childhood decay - 57%

Bruerd, B et al., BBTD in American Indian and Alaska Native communities: a model for planning, Public Health Rep 1989: 104, 63-40

Smithsonian study - same culture -
but during prehistoric era - 1.4%

Historic Skull Studies

- **Palmer, B.** - deciduous teeth - Smithsonian
– 1344 teeth - caries rate - 1.4%.
- **Torney, P.** - skulls in literature, 500-1000 years old - 0.2% caries rate.
- **Price, W.** - 1000s of skulls - pre-civilized societies - minimal decay - ideal occlusions.
- **Black, G.V.** - multiple studies in Europe by others.
- **Molnar, S.** - 600 pre-civilized skulls - Australia - free from decay

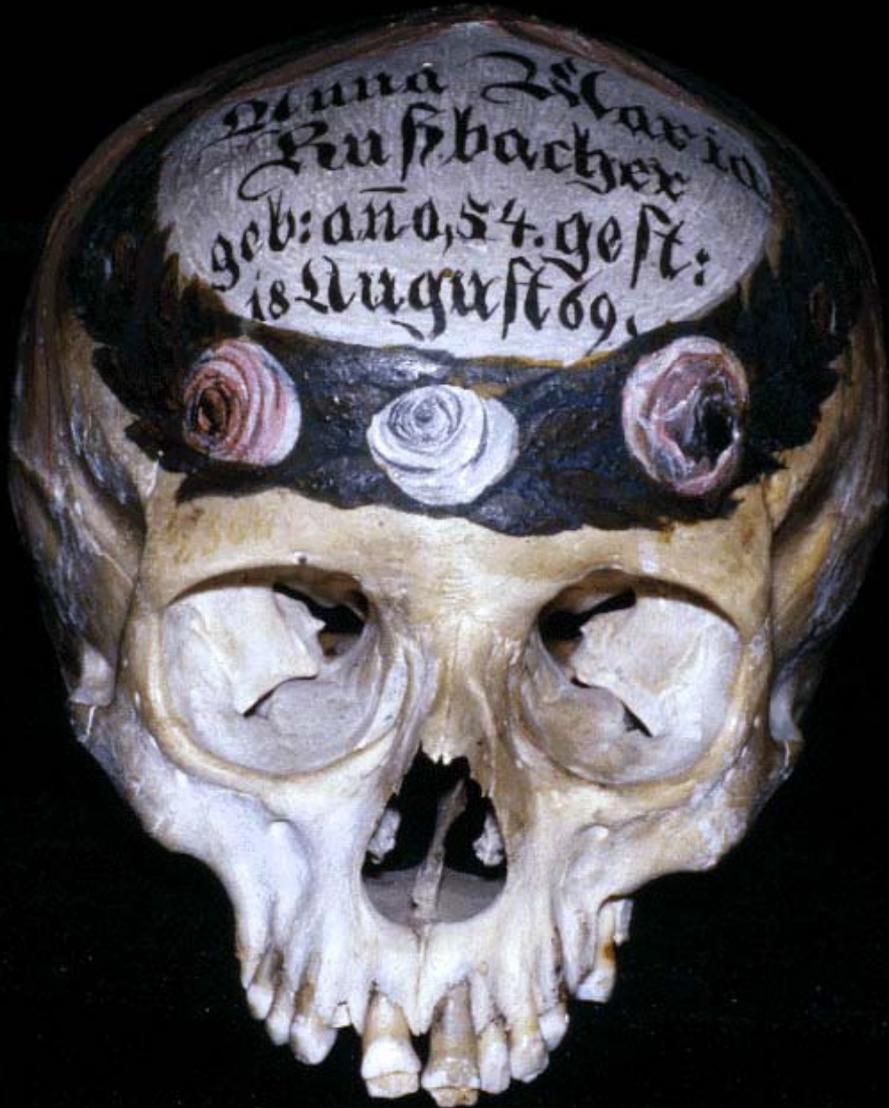
Anthropology data

- Anatomically modern humans - 100,000 years
- Very modern humans - 30,000 years
- Caries developed - 8,000 - 10,000 years ago
- This means that breastfed babies had no decay for 92,000 years

Anthropologist's position:

- If breastmilk caused decay - evolution would have selected against it.
- It would be evolutionary suicide for breastmilk to cause decay.

Examples of Defective teeth



Decorated Bavarian skull with defective central incisors



Hypocalcification of Bavarian central incisors



31 Teeth deformed for tribal custom caused abscess.

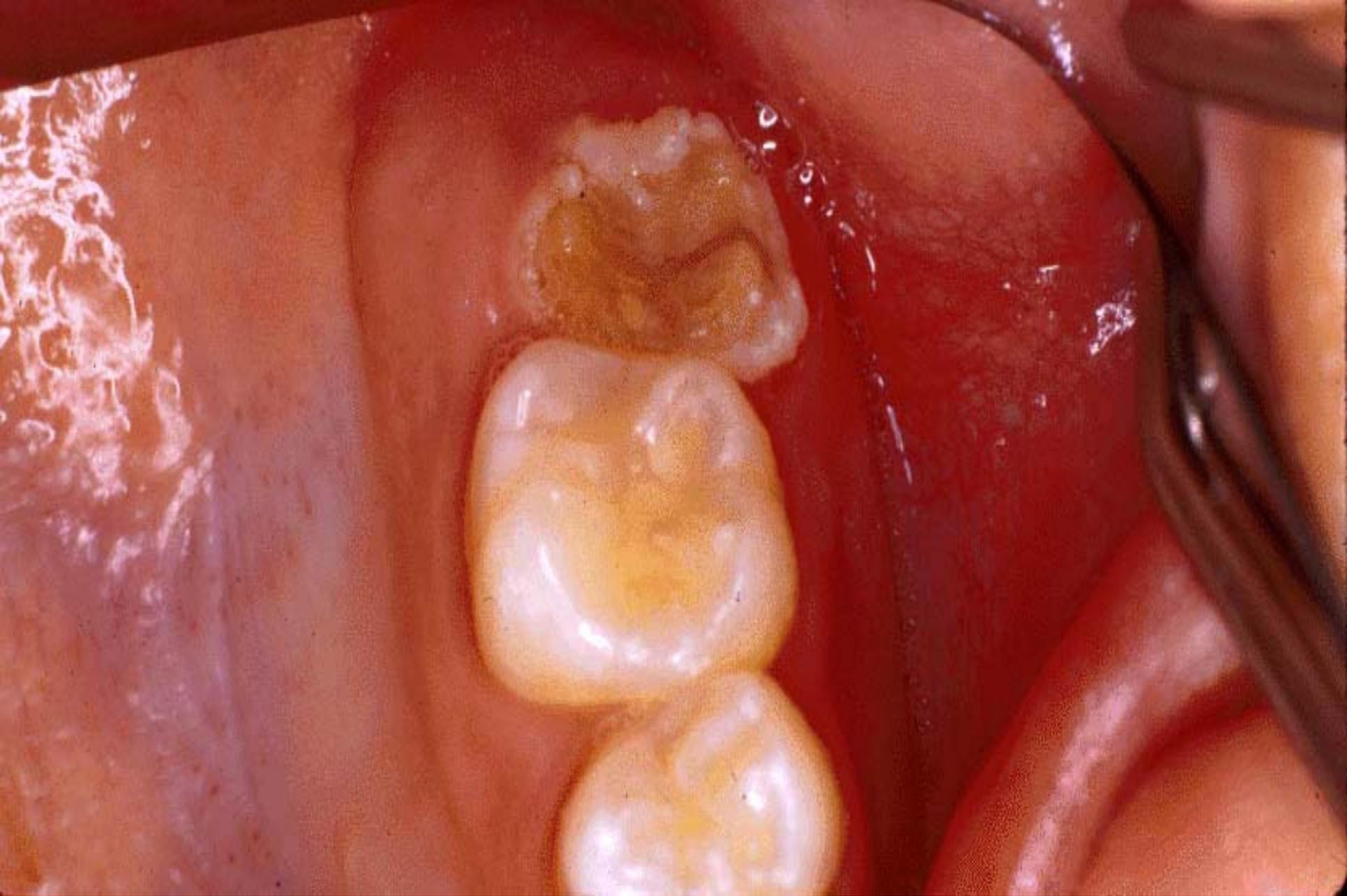




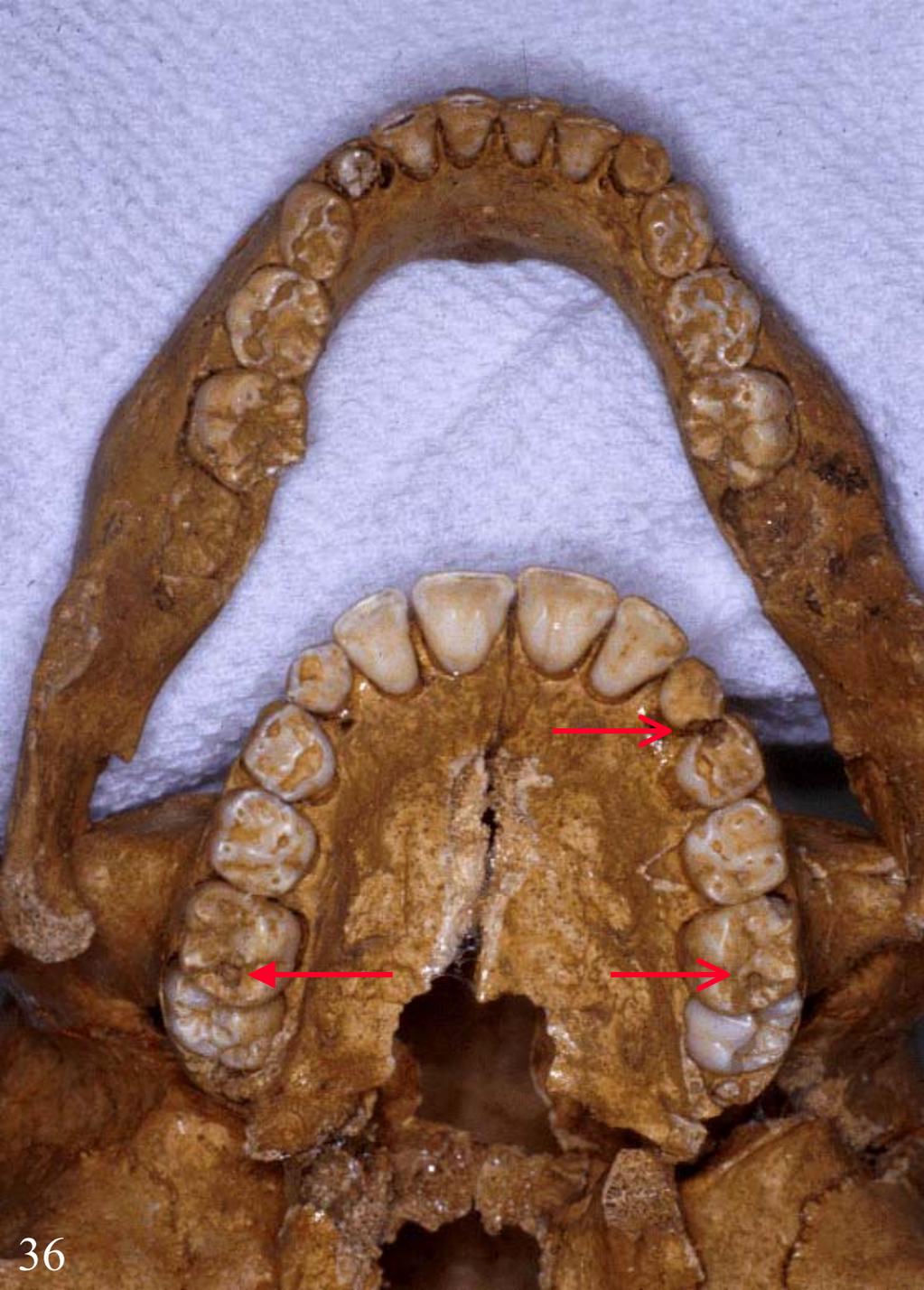
Developmental enamel defects



34 Congenitally defective teeth - mother' side of family.



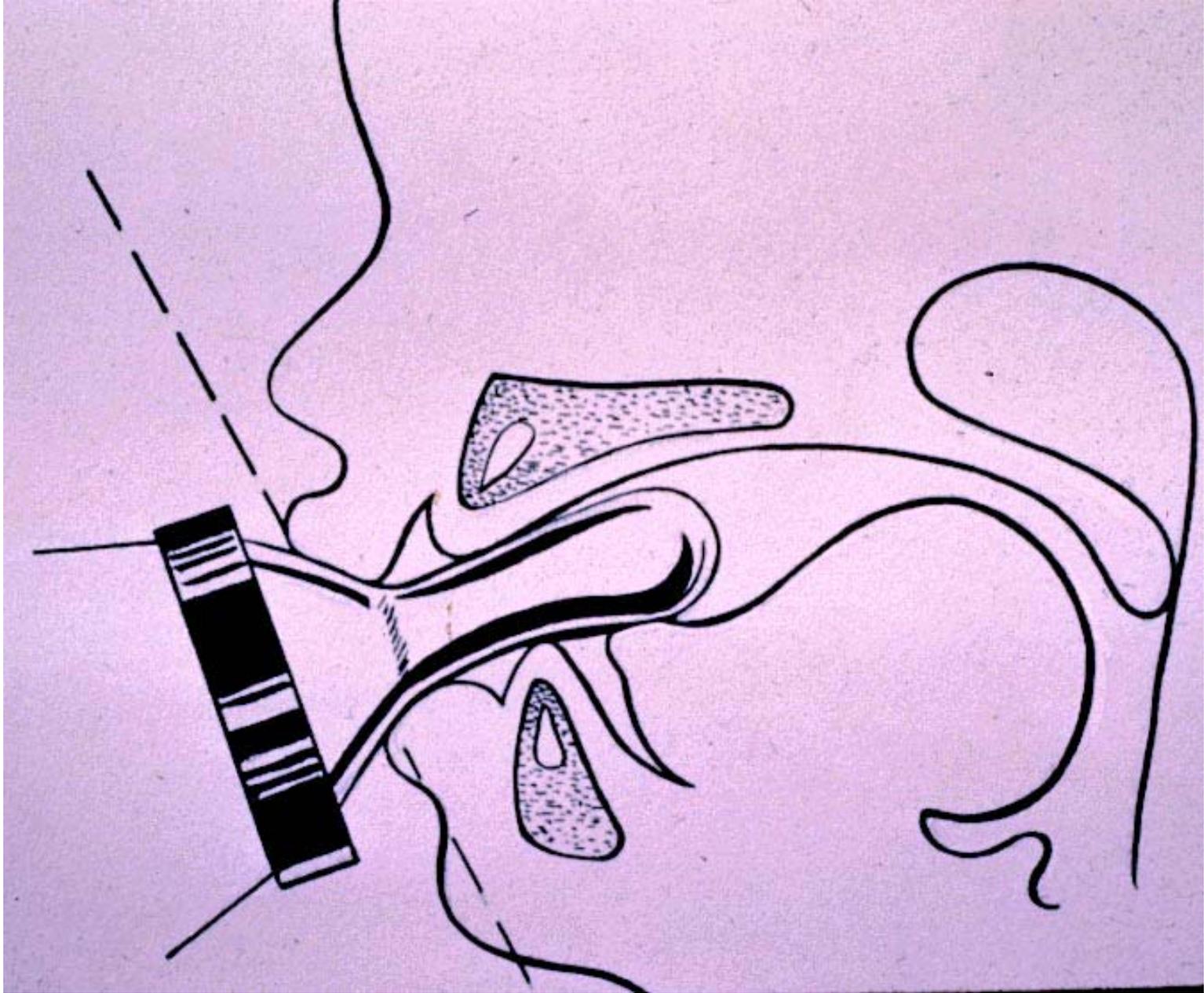
35 Tooth shedding defective enamel as it erupts



Prehistoric infant skull with decay - but infant was close to 11 years old.

Decay on deciduous teeth was probably counted as infant decay - but probably developed long after infant was weaned.

“Pooling”
and
Lactose



Bottle milk is dumped around teeth

Milk is normally expressed into throat while breastfeeding, not around teeth in the mouth.

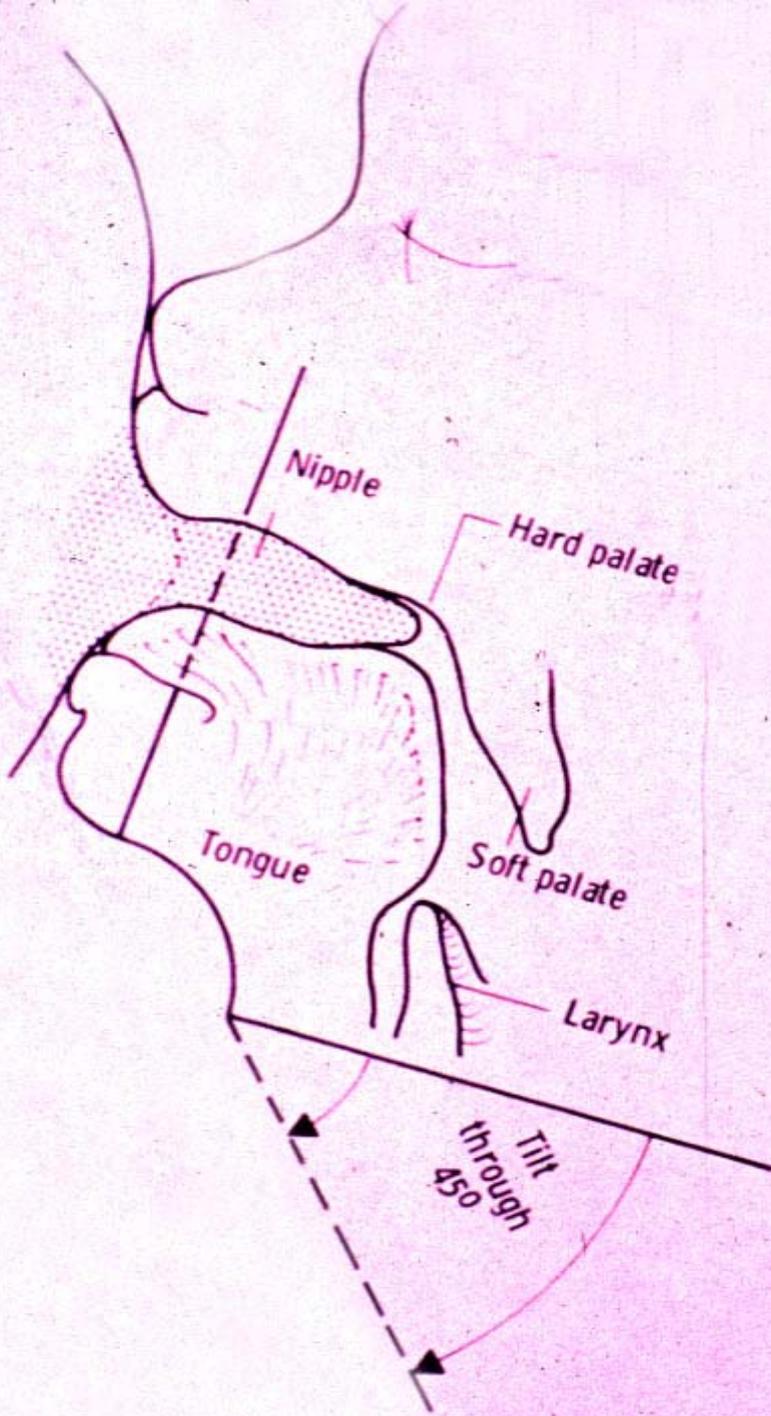


Illustration from: F Weber, M Woolridge, J Baum, An ultrasonographic study of the organisation of sucking and swallowing by newborn infants, *Dev Med Child Neuro*, 1986,19-24.

Lactose

- a disaccharide (carbohydrate)
- yields two monosaccharides
 - galactose and glucose

Introduction to General, Organic & Biochemistry,
3rd Ed. 1991, Saunders

Lactose

- found only in mammal milk
- in lower intestine - turns to Lactic acid
- L. acid promotes *Lactobacillus bifidus*
- *L. bifidus* helps prevent intestinal putrefaction
 - one of the benefits of breastfeeding
- Milk is the best source of calcium and lactose

Guthrie, H. Introductory Nutrition, 1983, C.V.Mosby, p26

Mammals

- There are **4640 species** of mammals
 - Humans are but **one** species
- All species breastfeed their young
- Most, but not all, have lactose in their milk.
 - Dr. Olaf Oftedal - National Zoological Park
- Humans are the **only** mammal with any significant decay in deciduous teeth.

“Most animals do not have decay in their deciduous teeth”

- Dr. Peter Emily - Father of Veterinarian Dentistry

Literature Review

Milk and caries

- Rats **fed milk** as the sole source of nutrition **did not develop caries**.
- Rats given sucrose-milk solutions had **fewer** caries than those given sucrose-water solutions.

Dreizen, S. et al. The effect of cow's milk on dental caries in the rat. J Dent Res, 1961; 40:1025-28.

“Milk has been shown to
remineralize artificially
demineralized enamel in vitro”

McDougal, W. Effect of milk on enamel demineralized and remineralized in vitro. *Caries Res*, 1977;11:166-72.

“Cariogenic bacteria may not be able to utilize lactose as an energy source as readily as sucrose”

Rugg-Gunn, et al. Effect of human milk on plaque pH in situ and enamel dissolution in vitro compared with bovine milk, lactose and sucrose. *Caries Res* 1985;19:327-34.

Strep mutans is highly susceptible to the bactericidal action of Lactoferrin.

LF chelates iron, making this essential nutrient inaccessible to an invading microorganism.

(LF is present in breastmilk)

Arnold, R. et al. A Bactericidal Effect for Human Lactoferrin. Science, July 15, 1977; 197(4300):263-5

Caries is an infectious and transmissible disease

- Primary infection is by *S. mutans*
- Get accumulation of these organisms to pathogenic levels - due to frequent and prolonged exposure to cariogenic substrates
- Then get rapid demineralization of enamel resulting in dental caries

Berkowitz, R. Etiology of Nursing Caries, Public Health Dent; 1996:56(1).

Caries Prevention

- *Mutans streptococci* - one of the major cariogenic organisms.
- Secretory *IgA* - Major oral antibody
 - enters mouth via salivary glands.
- *IgG* - Major serum antibody
 - enters mouth via gingival crevicular fluid.
- Studies show both have potential for retardation of streptococcal accumulation.

(Both *IgA* and *IgG* are present in breastmilk)

Irwin Mandel, Caries Prevention: Current Strategies, New Directions, JADA, Vol. 127, Oct, 1996, 1477-88.

Nursing Bottle Caries

Associated with:

- Sleep time “bottle” feeding
- Physiological xerostomia (dry mouth)
- Infection with *mutans streptococci*
- The later the primary teeth are colonized with *mutans strep*, the less likely caries will develop (can be transmitted by family).

Suhonen, J. et al., Release of Preventive Agents from Pacifiers in Vitro. 1994, Schweiz Monatsschr Zahnmed, 104(8):946-951.

Factors related to high caries rate while child is in utero

- Maternal bereavement or stress ($p < 0.005$).
- Reduced intake of dairy products ($p < 0.02$).
- Medically diagnosed illness of mother ($p < 0.05$).
- Taking of antibiotics by mother.

Patrick H. Torney, Oct. 1992, M.Dent.Sc Thesis:
Prolonged, On-Demand Breastfeeding and Dental Decay -
An Investigation, Dublin, Ireland.

Editorial - Dr. Paul Casamassimo

- BBTD is a **STD** - **S**ocially **T**ransmitted **D**isease
- It can occur in the best of families
- It is a symbol of societal pressure and breakdowns
 - the two parent working family
 - the adolescent single parent
 - the loss of the multigenerational family
- Unfortunately, like substance abuse in a dysfunctional society, BBTD has become someone else's problem, but not of the infant's family.

Casamassimo P., Hooked, *Pediatr Dent*. 1997; 19(1):6

Caries is an infectious and transmissible disease

- Primary infection is by *Strep mutans*.
- Get accumulation of these organisms to pathogenic levels - due to frequent and prolonged exposure to cariogenic substrates.
- Then get rapid demineralization of enamel resulting in dental caries.

Robert Berkowitz, Etiology of Nursing Caries, J Public Health Dent. 1996; 56(1):51-54.

“Breastfeeding of the child for more than 40 days may act preventively and inhibit the development of nursing caries in children.

Oulis, CJ et al. Feeding practices of Greek children with and without nursing caries, *Pediatr Dent*, 1999. Nov-Dec; 21(7):409-16.

Why are teeth more prone to decay while sleeping?

“During sleep, less saliva is produced and so its protective effect is less than when the child is active.”

Pamphlet: *Dangerous in Bed*, published by the Canadian Dental Association.

(Mouth breathing significantly dries teeth out)

“Study demonstrates that prolonged demand breast-feeding does not lead to higher caries prevalence.”

Weerheijm KL, Prolonged demand breast-feeding and nursing caries, Caries Res, 1998;32(1):46-50.

Guilt by association:

Don Gardner et al., *At-Will Breast Feeding and Dental Caries: Four Case Reports*. J Dent Children, 44(3), May-June 1977, 18-23.

Based on observing caries in infants whose mothers were adamant about breastfeeding, the authors concluded: “breast milk alone or with carbohydrates can be cariogenic. They recommended mothers “discontinue nursing as soon as the child can drink from a cup (approximately 12-15 months).”

Authors felt they were the first to make the link between breastfeeding and caries: - “There are no notation in the dental literature about breast-feeding and its relationship to dental caries.” (p19).

This article is referenced in many other articles accusing breastfeeding as a causative factor for infant caries.

Most recent literature

Human breastmilk kills cancer cells.

Catharina Svanborg of Lund, Sweden has discovered that human breastmilk has killed all cancer cells tested.

The cancer killer is one of the most abundant proteins in breast milk - alpha-lactalbumin, which helps to produce lactose.

Stomach acid may be the key to its activation.

Research received a \$200,000 grant from the American Cancer Society - the only non-American lab with ACS support

P. Radelsky, Human Breast Milk Kills Cancer Cells,
Discover magazine, June, 1999, 68-75.

“Population-based studies do not support a definitive link between prolonged breast-feeding and caries.”

H. Slavkin, *Streptococcus Mutan, Early Childhood Caries and New Opportunities*,
JADA, Vol. 130, Dec. 1999, 1787-92.

Harold C. Slavkin, D.D.S. - Director, National Institute of Dental and Craniofacial Research,
National Institute of Health, Bethesda, Md.

- Due to the contradictory nature of previous research findings and weak methodology used - authors concluded that the **evidence linking breastfeeding and infant caries remains equivocal** (vague, ambiguous, doubtful, questionable).
- Recommendation: There is no “right time” to wean a breast-fed infant.

Joyce Sinton et al., A systematic overview of the relationship between infant feeding caries and breast-feeding.

Ont Dent, 1998; 75(9)(Nov):23-27

Pamela Erickson, DDS, Ph.D.. - Article #1

Estimation of the caries-related risk associated with infant formula, *Pediatr Dent*, 1998;20(7)(Nov-Dec):395-403

- Certain formulas dissolved enamel mineral.
- Most formulas reduced pH significantly.
- Some formulas caused dentinal caries by 3.4 weeks and pulpal involvement by 7.2 weeks.
- Some formulas supported significant bacterial growth.

For this article, Dr. Erickson won first place, 1997, AAPD Educational Foundation Research Award.

Pamela Erickson - Article #2

Investigation of the role of human milk in caries development.

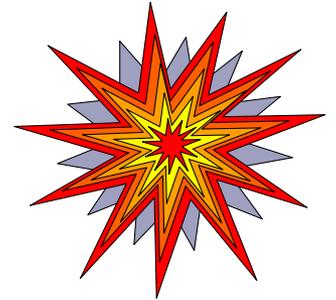
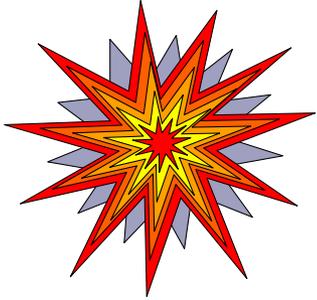
Pediatric Dentistry, 1999;21(2)(Mar-Apr):86-90.

For this article, Dr. Erickson was runner up for 1998, AAPD Educational Foundation Research Award.

Conclusions:

- Calcium and phosphorus are actually deposited onto enamel powder after incubation with HBM.
- HBM does not cause a significant pH drop in plaque.
- **HBM is not cariogenic in an in vitro model**, unless another carbohydrate source is available for bacterial fermentation.
- The buffer capacity of HBM is very poor.
- HBM supports moderate bacterial growth.

Pamela Erickson, Investigation of the role of human milk in caries development. *Pediatric Dentistry*, 1999;21(2)(Mar-Apr):86-90.



Human breast milk is NOT cariogenic

Pamela E. Erickson. Investigation of the role of human milk in caries development. *Pediatric Dentistry*, 1999;21(2)(Mar-Apr):86-90.

For this article, Dr. Erickson was runner up for 1998, AAPD Educational Foundation Research Award.

In Summary:

Main Reasons for Decay

- **Sugar**
 - Frequency of exposure is more important than amount.
- *Strep mutans*
 - Timing and amount of inoculation is important.
- **Saliva flow**
 - Saliva helps flush away bacteria
 - Mouth breathing dries mouth and teeth
- **Enamel defects** - When and why is important.
- **Poor oral hygiene** habits of infant AND family.
- **Poor eating habits** - Exposure to sugar is key point.

“It is store bought food
which has given us store
bought teeth”

E. Hooton, 1938

Breastmilk alone does

NOT

cause tooth decay!

BUT

“Exclusive breastfeeding” does not mean that the infant will be immune from decay.

Recommendations

- Develop a questionnaire that can be given to all parents with children who have decay to evaluate all risk factors.
- Educate parents and parents-to-be on what foods can result in infant decay.
- Educate parents on the importance of their infant's oral hygiene as well as their own.
- Educate health care providers that breastmilk is not a risk factor for infant caries.

AAPD Position

The American Academy of Pediatric Dentistry (AAPD) is an excellent association with a lot of influence over its members. It is hoped they will review the most recent research and possibly alter their position on the relationship between breastfeeding and infant caries.

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