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1 Give a short definition of early childhood caries (ECC).
2 What children are most affected by ECC?
3 What are the telltale signs of ECC?
4 What are the consequences of ECC?
5 What steps are recommended to prevent ECC?

Name: ________________________________________________________
Permit No.: ______________________________
The High Incidence of Early Childhood Caries in Kindergarten-age Children

Early childhood caries in pre-school children has been discussed extensively in the scientific literature over the past 40 years. A review of the most recent studies shows that the dental community is looking at the problem with renewed interest and that more information is needed in regard to the epidemiology, etiology, diagnosis, prevention and treatment of caries in children ages 0 to 5 years. This article presents a definition of caries in pre-school children and discusses related epidemiological data from a 1998-99 study on the oral health of Québec schoolchildren in the 5-6 and 7-8 age ranges, in which 2,512 kindergarten students who were considered representative of their peers in Québec were chosen at random. The examinations were performed by 13 dentists/examiners who previously had received theoretical and practical training on WHO criteria for diagnosing caries for epidemiological inquiries.

Definition of early childhood caries

A group of experts designated by the National Institutes of Health to develop and adopt a consensus regarding a clinical definition and diagnostic criteria for these types of caries has also adopted the term early childhood caries to describe caries in preschool-age children. The following clinical definition of early childhood caries (ECC) has been proposed:

The presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries) or filled tooth surfaces in any primary tooth in a preschool-age child between birth and 71 months of age.

More specifically, experts recommend using the term Severe Early Childhood Caries (SECC) to designate all caries considered atypical, progressive, acute or rampant. This category thus includes baby bottle tooth decay, nursing caries, maxillary anterior caries, labial caries, comforter caries, and rampant caries. Gagnon considers that SECC are merely an incidence of ECC under special or specific conditions.

Which teeth are the most susceptible to caries?

ECC affect the primary teeth of infants and pre-school children. In their severest form, they sometimes appear as quickly developing lesions on the surface of teeth with low susceptibility to caries, following the usual eruption sequence. Typically, the maxillary primary incisors are hit the hardest, followed by the first primary molars. The mandibular incisors normally are spared because they are covered by the tongue during suction movements and are thus buffered against cariogenic liquids. This broader term encompasses other, less understood, practices as etiological factors, such as malnutrition, cariogenic childhood foods, and bacterial transmission from mothers or caregivers to children.
primary molars, because of their later eruption, are usually spared or little affected by ECC. The ECC attack pattern therefore depends on three factors: the timing of the tooth eruption, the time span of the harmful oral habit, and the type of muscle movements the child makes when sucking.

Many authors agree that the attack pattern of ECC changes at age three, when it begins to affect the first and second primary molars. These results suggest that a caries attack pattern should be established for different age categories of children ages 0 to 71 months. Drury et al recommend the use of six categories: under 12 months, 12-23 months, 24-35 months, 36-47 months, 48-59 months and 60 to 71 months. In fact, according to Milnes and Bowen, practical experience has shown that the cariogenicity of the foods parents use to nourish or soothe their infants is a reliable indication of a child’s predisposition for subsequent caries when their diet changes from liquids to solids. The type of solid or liquid food could well explain the differences in the ECC attack patterns at different ages.

Is there a high incidence of early childhood caries among the general population?

The 1998-1999 study on the oral health of Quebec children ages 5 and 6 reveals that upon entering kindergarten, 42% of children already had ECC on their primary teeth, with, on average, 3.9 carious surfaces. In the same vein as the provincial study, Corbeil et al reported that in 1994-1995, nearly 40% of children living in the Montérégie area had caries on their primary teeth and an average of 3.4 carious surfaces or absent or filled teeth. By kindergarten, the children had nearly 70% of all the caries that would form on their temporary teeth. While it may be informative to compare the prevalence of ECC in Québec with international statistics, the obvious lack of standardization in defining and establishing diagnostic criteria for ECC makes such comparisons impossible.

Which children are more prone to early childhood caries?

As is the case with other health problems, oral health is a factor of social inequality. While 58% of kindergarten children have no caries on their temporary teeth, a small group of kindergarten children (24%) have five or more affected temporary surfaces, which account for 90% of all affected surfaces on temporary dentition for this age group (Fig. 1).

The children with a high risk for caries have an average DMFS of 14.9, a rate six and a half times higher than that of children with lower risk factors (DMFS=1 to 4). As for treatment needs for caries on temporary dentition, 11.7% of kindergarten children have three or more surfaces requiring treatment, as well as the majority (83%) of all surfaces requiring treatment in that age group, while 77% of the children have no temporary surface requiring treatment (Fig. 2).

An important fact to note is that children with a high incidence of caries, and those who require extensive caries treatment, are mainly from poor families.

Which teeth and surfaces have a higher incidence of early childhood caries?

Figure 3 illustrates the percentage of temporary teeth in kindergarten-age children at the time of the exam that were affected by caries.

The most affected teeth were the four second molars and the mandibular first molars, with an incidence of 21% to 24% respectively, followed by the maxillary second molars (15%) and the maxillary incisors (4% to 8%). The mandibular incisors and the four canines were little affected. In addition, 45.7% of the carious temporary surfaces were pits and fissures, and were mostly occlusal (Fig. 4).
Conclusion
Caries activity involving temporary dentition begins early and develops rapidly. By kindergarten age, the incidence of ECC is already high. Furthermore, it is mainly concentrated among a small, vulnerable group of children who mostly come from disadvantaged backgrounds. These data demonstrate how important it is for dental health care providers to encourage their patients to take their children to the dentist beginning at around 12 months so that caregivers can be more informed about preventing ECC as soon as possible and the most disadvantaged clients can be given advice consistent with their challenges. The literature moreover advocates standardizing the terminology, diagnostic criteria, and definition of caries in preschool-age children with a view to making better comparisons of the prevalence of caries in children around the world.

Acknowledgements
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Bibliography
Importance of Early Diagnosis of Early Childhood Caries

1. Terminology

Early childhood caries (ECC) is a particularly virulent type of dental caries that can destroy the primary dentition of babies and pre-school children. ECC is considered a severe and rampant disease of the primary teeth that begins immediately after tooth eruption.

The term baby-bottle tooth decay was commonly used to denote caries of the primary teeth in very young children, caused by prolonged use of a baby bottle at bedtime or even during the daytime.

For some years now, the term early childhood caries has had widespread use. This term better reflects the multi-factor etiological process of the disease.

Among the other factors implicated are prolonged, on-demand breastfeeding, frequent consumption—i.e., more than three times per day—of cariogenic snacks (cookies, candy, cake, and so forth), pediatric syrups, lack of fluoride toothpaste use, and the absence of fluoride in drinking water.

It has also been recognized that cariogenic bacteria can be transmitted from mother to child through certain practices, for example, tasting the baby’s food with the same spoon, or testing the temperature of the nipple. In addition, poor oral hygiene in mothers has been associated with a higher concentration of micro-organisms in the mouth of their children.

2. Diagnosis

Early childhood caries is a serious and sometimes painful disease characterized by early onset and very rapid progression. The caries develop quickly, usually right after the teeth erupt. Several teeth may be affected, beginning with the maxillary incisors, at the junction near the gums, followed by the canines. If the disease continues to progress, the molars are affected too, while only the mandibular incisors are spared.

There are four stages in the development of ECC:

- The initial stage is characterized by the appearance of chalky, opaque demineralization lesions on the smooth surfaces of the maxillary primary incisors when the child is between the ages of 10 and 20 months, or sometimes even younger. A distinctive whitish line can be distinguished in the cervical region of the vestibular and palatal surfaces of the maxillary incisors.

At this stage, the lesions are reversible but are frequently unrecognized by parents or the first physicians to examine the mouths of these very young children. Moreover, the lesions can be diagnosed only after the affected teeth have been thoroughly dried.

- The second stage occurs when the child is between the ages of 16 and 24 months. The dentin is affected when the white lesions on the incisors develop rapidly, causing the enamel to collapse. The dentin is exposed and appears soft and yellow. The maxillary primary molars present initial lesions in the cervical, proximal and occlusal regions (Photo 1).

At this stage, the child begins to complain of great sensitivity to cold. The parents sometimes notice the change of colour on their own and become concerned.

- The third stage, which occurs when the child is between 20 and 36 months, is characterized by large, deep lesions on the maxillary incisors, and pulp irritation. The child complains of pain when chewing or getting his teeth brushed, and of spontaneous pain during the night.
At this point, the maxillary primary molars are at stage 2, while stage 1 can be diagnosed on the mandibular primary molars and the maxillary canines.

- The fourth stage, which occurs between the ages of 30 and 48 months, is characterized by coronal fractures of the anterior maxillaries as a result of amelodentinal destruction (Photo 2). At this stage the maxillary incisors are usually necrotized, and the maxillary primary molars are at stage 3. The secondary molars and maxillary canines and the first mandibular molars are at stage 2. Some young children suffer but are unable to express their toothache complaints. They experience sleep deprivation and refuse to eat.

A positive diagnosis is established on the basis of questions to parents regarding risk factors and a clinical endo-oral examination, completed by x-rays.

A differential diagnosis is based on observations of hereditary tooth structure anomalies such as infantile melanodontia, which primarily affects the maxillary incisors, and amelogenesis imperfecta, which affects the enamel of every tooth, and is a hereditary disease of the dentin, characterized by an opalescent, brownish tooth colour, and typical short roots. Enamel hypoplasia caused by malnutrition during the perinatal period or by a deficit in Vitamin A promotes a high caries susceptibility and is often associated with early childhood caries.

3. Repercussions

Early childhood caries can have serious general and local repercussions in the short and long terms.

Following pulp necrosis, infection spreads to the pulpal-periodontal region in one of two clinical forms: the acute form, characterized by cellulitis, adenopathy and mobility of the affected teeth, and the chronic form, which is the most common, characterized by abscesses and interdental septum syndrome. Depending on the severity of the disease, infection can spread to the buds of the permanent teeth, causing irreversible lesions. Complications from subsequent infections can occur in children already compromised by a generally weakened state of health.

Contrary to popular belief, the effects of caries in young children extend beyond the mouth. Tooth loss is sometimes inevitable, and it can cause not only orthodontic and esthetic problems, but more importantly, difficulties in pronunciation. Esthetic problems and pronunciation difficulties may result in psychological and relationship problems. In addition, children with ECC usually weigh less and are shorter than average. Their growth is affected because they have difficulty sleeping and eating as a result of the infection and pain, and their quality of life is greatly diminished.
Furthermore, it is very complicated and costly to treat caries in very young children, who must undergo general anesthesia. ECC is therefore a burden both for parents and society. Intervention at the early stage is necessary to prevent the destruction of the crown and stop the caries from progressing. It involves simple techniques to remineralize the enamel, such as topical applications of fluoride, fluoride solutions and fluoride varnishes.

In conclusion, early diagnosis of early childhood caries and the identification of risk factors are essential to the implementation of preventative and curative measures to mitigate complications and the repercussions of the disease. Physicians and nurses have more opportunities to see expectant mothers and their newborns than dentists do. It is therefore vital to emphasize parental awareness of the seriousness of ECC so that proper attention is placed on early detection and the elimination of risk factors.

Bibliography

Prevention of Early Childhood Caries (ECC)

Early childhood caries (ECC) unfortunately is still a common disease in young children. It is defined clinically as the presence of one or more decayed (non-cavitated or cavitated lesions) that can develop extremely quickly and lead to the widespread and sometimes painful deterioration of the primary dentition.

The etiology of ECC is multifactorial and has been well established. ECC is frequently associated with a poor diet and bad oral hygiene habits.

Severe ECC quickly destroys the smooth surfaces of teeth that are usually considered low risk; recent studies have underscored the infectious nature of this disease and its transmission from mother to child. One study showed that Streptococcus mutans genotypes in children were similar to those of their respective mothers in 71% of cases among 34 mother-child pairs. However, this study was unable to highlight the father-child transmission indices but did reveal a possible transfer of microorganisms among children in daycare settings.

The most common transmission modes were mother and child using the same spoon, contact between the mother’s saliva and the child’s mouth, improper baby bottle use, and family members using the same toothbrush.

ECC most frequently affects people in low socioeconomic levels. A longitudinal study on the development of Quebec children (ELDEQ) revealed that living in disadvantaged conditions from birth increases a child’s risk of developing caries by 112%, as compared to growing up in wealthier circumstances.

In view of the infectious nature of ECC and the transmission mode of the microorganisms responsible for the development of caries, it is important to develop a hygiene education and prevention plan with parents during the first visits. This plan should take into account the family’s living conditions and sociocultural environment.

I Prevention of ECC at the dentist’s office and community centres

Working together with other stakeholders in the community gives dentists access to skills and tools that aid in the prevention of ECC. A dental health promotion program presented in books, brochures, stickers or videos and made available in dentists’ offices and community centres can potentially lower the incidence of ECC in communities at high risk for caries.

This type of dental health promotion program must be geared to expectant parents or the parents of very young children. The dentist’s office can become the centre of a new prevention concept aimed at families as the dentist acts in tandem with other health professionals to meet the full range of family needs. The dentist could make the pediatricians in his area aware of the importance of preventing ECC and being on the lookout for the disease during the child’s first visits (for instance, during vaccination appointments). In addition, practitioners can work in cooperation with the public dental health network. Multidisciplinary collaborations of this nature are essential to an effective program.

II Preventing ECC before conception and during pregnancy

The expectant mother should be monitored for dental problems during pregnancy and given the appropriate prevention recommendations before the birth of her baby. This step is all the more necessary because the parents will not be seeing the dentist again for several months, when bad habits may be entrenched and already causing a proliferation of carious lesions at advanced stages of decay. An evaluation of individual risk for caries is very necessary, as it is the first step in defining and optimizing preventive and therapeutic strategies. This step should only be carried out when the dentist has noted poor oral health and/or eating habits or when there is a high incidence of active caries in the expectant mother or her family.
Prevention of Early Childhood Caries...

The evaluation of the risk for caries during pregnancy must take the following into account:

- The presence of carious lesions and the degree of caries activity.
- A quantitative and qualitative evaluation of dental plaque (colour, number of streptococcus mutans and/or lactobacillus colonies).
- Evaluation of the salivary pH, the saliva's buffering effect, and salivary flow.
- An analysis of the mother's diet.
- Evaluation of the extent of individual resistance by looking at the morphological structure of the teeth, the presence of numerous initial carious lesions, and past fluoride use.

Together, these tests will help confirm the dentist's clinical impressions, determine the existence of one or more preponderant risk factors (bacteria, nutrition, saliva or individual resistance) and prepare a preventive and therapeutic strategy that will provide a more targeted and effective response to the aetiological factors identified. At this stage, the provider will have to control the bacteria and eliminate the sources of infection, in view of the risk of bacterial transmission.

The bacteria control phase consists in reducing the number of bacteria, and more specifically, reducing the amount of streptococcus mutans on the surface of the teeth. A number of treatments are available for this purpose, including the application of varnishes with a high fluoride concentration or chlorhexidine varnishes (with or without a mouthguard).

The sources of infection must be eliminated as soon as possible by debriding the carious lesions and placing temporary fillings (zinc oxide eugenol, calcium hydroxide, or glass ionomer cements) in order to stabilize the patient's condition and lower contamination risks. Further restorations should not be contemplated until the level of carious activity has been fully controlled.

The mother could use substitutes like xylitol (gum or candy) during the pregnancy. She may continue this habit after the birth as well. Every member of the family should take part in an oral hygiene education program if a high risk for caries is present. Naturally, this should be accompanied by routine maintenance and reinforcement programs.

Given hormone fluxes that occur during pregnancy and regardless of the risk level for caries, it is important to periodically monitor the dental health of expectant mothers. However, fluoride supplements are not recommended before the baby is born.

Once the baby's first tooth erupts, the child's mouth must be cleaned with a wet cloth or with a child's toothbrush and a small amount of fluoride toothpaste (about the size of a grain of rice). Parents should be taught how to brush their baby's teeth, either by resting the baby against them, or laying the baby on their lap with his head between their legs. These positions will give them the control they need to accomplish the task. When the baby reaches the age of one, his teeth should be brushed twice a day with a small toothbrush and water and fluoride toothpaste (about the size of a pea). Between the ages of 18 and 24 months, the child can learn to brush his teeth under adult supervision.

In addition, parents should not try to soothe a crying or agitated baby with candy, a pacifier dipped in sugar, or a bottle containing a sweet drink.

Lastly, it is important to talk to expectant parents about the importance of the first dentist's visit.

III After the birth

Baby's first dental visit should be during the first year of life, preferably during the first six months following the eruption of his first teeth, but no later than his first birthday. During the first visit, the dentist will examine the baby's mouth and give specific oral care advice for preventing ECC.

It is important to talk with parents about the following points:

- Verifying and reinforcing the information and advice given during pregnancy.
- Reinforcing that the child should not be given cariogenic substances in his bottle at bedtime.
- Encouraging healthy eating and limiting sugary foods by suggesting other types of sweeteners.
- Cleaning the child's teeth as soon as they begin to erupt.
- Encouraging the child to drink out of a cup around his first birthday, and then progressively limiting the use of the bottle between the ages of 12 and 16 months.
- Observing the baby's early habits such as thumb sucking, so that the caregiver can receive timely instructions in correcting it, even if that means giving the child a pacifier. No connection has been noted between pacifier use (as long as it has not been dipped in a sweetener) and ECC.

If the provider notices ECC once the primary teeth have erupted, he must evaluate the child’s risk for caries just as he did with the expectant mother.

He must also prepare a personalized prevention program and choose a fluoride therapy (systemic and topical) according to the caries risk and the patient's age in order to enrich the fluoride of the budding teeth's enamel and increase the caries resistance of the teeth that have already erupted.

Fluoride supplements (0.25 mg) are not recommended for low-risk children under the age of three. For high-risk children,
fluoride tablets (0.25 mg) are recommended beginning at the age of 6 months, i.e. when the child first visits the dentist. In all cases, before prescribing it is very important to:

- Evaluate the risk for caries
- Ensure that the child is not drinking fluoridated water or taking fluoride supplements (in vitamins)
- Adjust the dosage schedule in consultation with the attending pediatrician
- Evaluate other possible sources of systemic ingestion (total daily ingestion must not exceed 0.05-0.07 mg F/ kg)

The success of fluoride therapy depends on the parent's motivation and participation, regular check-ups and adjusting the dose depending on the dosage schedule.

Brushing the teeth with a fluoride toothpaste must immediately be added to the child's daily oral health regimen as soon as his first primary tooth erupts.

The use of topical fluoride in the form of a varnish or gel is beneficial but not recommended before the child turns one. It could be used to foster the protection of the smooth surfaces of primary teeth and the remineralization of the first carious lesions.

Chlorhexidine varnishes can be used in children between the ages of 3 and 4 with a high risk for caries, in order to reduce the quantity of streptococci within the dental plaque and as a tool for the bacterial control phase. This may be a preferred method when traditional methods are not enough. Unfortunately, these products are not available in Canada.

Sealing agents are evidently entirely indicated to prevent occlusal caries of the primary molars, and should be used beginning at age 3 after consideration of the caries risk and clinical recommendations.

Substituting sugar with xylitol or other artificial sweeteners (sorbitol and mannitol) in candy, and the recent appearance of products made with casein phosphopeptide or amorphous calcium phosphate (in chewing gum and toothpaste) will have interesting applications in preventing EEC in the future. These products may help remineralize teeth by binding themselves to the biofilm, the dental plaque and the hard and soft tissues of the mouth and liberating calcium and phosphate ions into the saliva. Further research will be necessary to determine optimal frequency of use and the recommended applications according to age.

Lastly, it would be important to schedule children at risk for regular three-month check-ups and to stay in touch with parents in order to provide proper follow-up.

IV The challenges ahead

Despite a dental health provider’s efforts to implement a prevention program, sometimes the outcome does not meet expectations. The prevention program must be accompanied by individual counselling of the parents. A psychological approach should be emphasized, one that provides feedback on performance and encourages children to be proactive (by learning and integrating oral health techniques and adopting a healthy daily diet).

The collaboration of practitioners with the public health network, particularly with respect to coordinating and developing dental health promotion activities, must be strengthened so that greater numbers of parents and/or children will receive advice and preventive care under the programs of the public dental health care network.

Conclusion

The etiological factors of EEC are known, and there is an arsenal of preventive and curative therapies available to help practitioners prevent and properly control EEC.

EEC prevention is an essential component in any dental health promotion program, providing a solid foundation for the optimal development of children.
**SUMMARY OF THE SUGGESTED RECOMMENDATIONS FOR PREVENTING EARLY CHILDHOOD CARIES**

<table>
<thead>
<tr>
<th>Age</th>
<th>During pregnancy</th>
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1 Starting at age 3  •  2 When first tooth erupts  •  3 Fluoride toothpaste and mouthwash  •  4 Fluoride toothpaste  •  5 Chlorhexidine varnish
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3 Drury TF, Horowitz AM, Ismail AI, Maertens MP, Rozier RG, Selwitz RH. Diagnosing and reporting early childhood caries for research purposes. A report of a workshop sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration. J Public Health Dent 1999; 192-7.


The dental literature clearly supports the use of pit and fissure sealants as a safe and effective, although underused, treatment in caries prevention. It is best used for high caries risk populations and it requires diagnosis and application by trained dental personnel paying close attention to proper protocol.

Sealant application requires periodic follow-up examinations and repair to ensure its efficacy and its cost effectiveness.

Although the occlusal surface is only one of five coronal tooth surfaces, it accounts for more than two-thirds of the dental caries experienced by children. This statistic, along with the rise in dental caries in Quebec, requires that we use all available treatment modalities to control decay. Among these is the application of pit and fissure sealants into the occlusal fissures of caries-susceptible teeth thus forming a bonded protective layer preventing nutrients from reaching caries-producing bacteria. This treatment was first reported by Cueto and Buonocore in 1967 and has been highly recommended in dentistry. Recent studies have showed that after eight years about 80% of the sealed fissures had sealant retention and no caries, and another 16% of the sealed occlusal surfaces had partial sealant retention and no caries. After ten years only 6% of the sealed occlusal surfaces showed any caries or restorations. These results clearly underscore that sealants are a very effective treatment in the control of dental decay, and yet only 18.5% of U.S. children aged 5-17 years had sealants on their permanent teeth.

The teeth selected to be sealed are typically first and second permanent molars, pre-molars and then primary molars. The caries risk assessment of both the patient and the tooth are important determinants of the need for sealants. The risk of caries in fissures extends beyond early childhood and post-eruptive age alone should not be considered a major criterion for sealant application. The caries risk level of our patient population and the absence or presence of fluoride programs are key determinants to be considered. The indiscriminate use of sealants in low-caries risk situations reduces the cost effectiveness of the treatment and should not be directed to all occlusal surfaces nor to all teeth with fissures. Appropriate decisions include past caries history, present oral hygiene, fluoride history, sound clinical examination and appropriate dental radiographs.

The key factor to completing successful sealants is proper tooth isolation. Wherever possible, a rubber dam should be used. This will aid in both moisture
control and keeping oral structures away from the teeth being treated. Alternatively, maintaining a dry field of operation can be accomplished by using a four-handed dentistry technique which is recommended when other methods of isolation such as cotton rolls, dry angles or Gamers clamps are used.

Teeth being selected for sealant application should be caries-free. Both a clinical and radiographic examination are required. Any dentin decay present precludes the use of a sealant and alternative treatment such as preventive resin restoration, composite resin, and possibly amalgam restoration should be considered. Enamel with suspect fissures involving incipient enamel decay should be prepared and the suspect grooves cleaned of all decay prior to the sealant application. Enamel preparation can be carried out by use of a slow-speed round bur, air abrasion, or a high-speed fissurotomy bur. This preparation of the tooth and removal of unsupported enamel has shown to increase bond strength and retention of the sealants.

**Protocol for Sealant Placement**

1. Examine tooth clinically and radiographically
2. Apply rubber dam, or other tooth isolation (Figure 1)
3. Prepare tooth
4. Reassess the presence or absence of decay
5. Clean the fissures with a brush with/without pumice
6. Rinse thoroughly
7. Acid etch the surface with phosphoric acid for 15–20 seconds (both permanent and primary teeth) (Figure 2)
8. Rinse well for 15 seconds
9. Air dry the surface thoroughly to ensure a frosty white, chalky enamel (Figure 3)
10. Where required, apply a drying agent/bonding agent (depending on which system is used)
11. Re-dry the tooth
12. Apply a thin layer of sealant-tease the sealant through the grooves with a brush or explorer (Figure 4)
13. Cure the sealant for 20-30 seconds
14. Check the sealant for voids or defects, if necessary add more
15. Verify the occlusion
16. Where required, adjust the occlusion and polish the sealant with a multi-fluted finishing bur
17. Reevaluate the sealant at recall appointments

Sealants have shown excellent success and retention rates. The most important cause for failure is poor tooth isolation and the ensuing saliva contamination. Other causes of failure include poor tooth surface preparation and/or failure of the sealant bond resulting in microleakage. This can lead to sealant loss and the potential for overt caries.
Pit and fissure caries are responsible for the greatest share of the dental caries experience in childhood. The dental literature clearly supports the placement of pit and fissure sealants on surfaces judged to be at high risk or on surfaces that exhibit incipient enamel caries. The success and cost effectiveness of sealants require that careful attention be paid to protocol as the treatment is highly technique sensitive. This treatment, as all dental treatments, is most effective when proper recall examination is performed and where necessary, resealing is done to ensure the maximum protection against dental caries.

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The Cariogenic Nature of Childhood Bedtime Rituals

Perinatal educators teach parents to develop an evening ritual to help their children go to sleep. As a result, mothers use a variety of bedtime strategies, which sometimes involve giving the child sugar. This practice increases their child’s risk for caries, particularly because salivary flow diminishes at night, reducing its buffering and cleansing effect. Parents are more inclined to settle for caries-causing rituals at bedtime because of their own fatigue at the end of the day. The goals of this article are illustrated in Figure 1: First, we provide an overview of different bedtime rituals that mothers use, followed by a description of cariogenic practices.

We then try to determine the extent to which caries-causing soothing rituals have become a public health problem by analyzing data from a study carried out in 2002 in the Montréal (a large region southwest of the island of Montréal, whose residents adequately represent the rest of the population). The study was conducted with 776 mothers of children between the ages of 15 and 18 months. Data was gathered through a self-administered 36-question survey.

Frequency of bedtime rituals and their cariogenicity

Figure 2 shows the various ways mothers comfort their children at bedtime. Among some of the strategies that involve little or no cariogenic activity, four routines are the most popular with mothers: 57% rock their child, 47% put on music or use a mobile, 33% read a story, and 23% stay by the child’s bedside until he falls asleep.

Twenty-nine percent of mothers expose their children to dental caries by putting them to bed every night with a bottle of milk. Studies have shown that when the oral flora comes into contact with lactose with increasing frequency and for longer periods of time, the cariogenic bacteria metabolize the lactose quickly.
thereby causing a risk for the development of early childhood caries (ECC). According to researchers, daily use of a baby bottle with cow’s milk at bedtime may be sufficient to demineralize the enamel, while its occasional use does not seem to increase the risk for ECC. Despite the efforts of dental care providers to raise parental awareness of the role of sugar in the development of ECC, some mothers still resort to using sugary foods to soothe their children at bedtime: 9% give a sweet treat, 9% give a highly cariogenic drink either in a cup or in a bottle that is taken directly to bed, while 2% give candy. And although these mothers use cariogenic foods to soothe their children, most of them also use other strategies that do not involve cariogenic foods, as described in Figure 2.

Are caries-causing rituals a public health problem?

Mothers use a variety of bedtime rituals that have different levels of cariogenicity. Figure 3 classifies mothers according to the cariogenicity level of the methods they use.

Sugary foods known to be highly cariogenic are used in the soothing routines of 16% of the mothers surveyed. Twenty-five percent of mothers do not use sugary foods but include a baby bottle in their daily soothing routine. In all, a total of 41% of mothers include cariases-causing practices in their bedtime rituals. Poverty tends to lead to increased use of sugary foods. About one out of three mothers in difficult socio-economic circumstances expose their children to highly cariogenic foods to help them fall asleep, as compared to one out of six mothers from wealthier backgrounds. In all, 60% of mothers from disadvantaged backgrounds use cariases-causing soothing routines. These statistics suggest that these cariogenic practices are spawning a major public health problem because children are ingesting sugars that harm their teeth, the practices are sufficiently widespread, and they occur widely among mothers from disadvantaged backgrounds.

What is the role of dentists in preventing early childhood caries associated with soothing routines?

In summary, the data speaks for itself: there is a clear need for early intervention. Parental practices that begin in the early stages of a child’s life forge the child’s early food preferences, and even dictate their long-term ones. We believe that as dental health providers, we can help prevent ECC associated with cariogenic soothing routines by recommending that our very young patients first visit the dentist as soon as their first tooth erupts, or no later than their first birthday. During this visit, parents should be made aware of ECC and encouraged to adopt healthy soothing routines at the child’s bedtime.

However, we must be understanding with families in poor circumstances. Their daily life is such that cariogenic practices are well-entrenched at bedtime, and they see a real problem in stopping their soothing strategies. It is our duty to ensure that the child is sufficiently exposed to fluoride in order to minimize the risk of ECC associated with these soothing routines. According to Burt and Pai, the ingestion of sugars...
represents a moderate to low risk in children with sufficient exposure to fluoride, but a high risk for those with no fluoride exposure.

Brushing with fluoride toothpaste before bedtime should be recommended, particularly when sugary foods are ingested right before sleep. Toothbrushing dislodges dental plaque and exposes the teeth to fluoride. The introduction of fluoride toothpaste is now recommended as soon as the first teeth erupt, as this will allow the fluoride to work topically and systemically. For very young children at risk for dental caries, or parents who have considerable difficulty brushing their children’s teeth, and for children who do not like the taste of toothpaste, fluoride supplements or fluoride varnishes are good ways to reduce the risk of ECC associated with soothing routines that have caries-causing effects.

Lastly, if there is one thing we should remember about preventing ECC associated with caries-causing soothing routines, it is that we must broach the subject with our patients at the earliest opportunity. This will give them a good start in introducing healthy soothing techniques, and help them avoid harmful routines that are difficult to stop.

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Bibliography
Dietary Recommendations for Healthy Teeth in Children

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The food industry is constantly flooding the market with increasingly processed products. Now that we have more knowledge and techniques to control the risk factors for caries than ever before, is it still appropriate and/or enough to tell our children to stay away from candy? To answer this question, we will first consider the foods necessary for tooth growth and briefly review the main characteristics in foods that contribute to cariogenicity. Lastly, we will learn to recognize the foods that do the most harm to our teeth, so we can guide children in their own choices.

A short history of teeth

Our teeth have their genesis while we are in our mother's womb. The embryonic development of our mouth and its neighbouring structures is closely linked to the availability of nutrients during the entire course of fetal development. Because of the intensity of metabolic activity, undernutrition or any other deficiency in protein, calcium, and particularly, vitamin D intake, leads to irreversible changes in the structure of developing cells. These changes can be observed not only in tooth enamel, but also in the salivary glands. The systemic influence of nutrition continues when permanent teeth are formed and even when the last permanent molar comes in.

From birth until around the age of 6 months, a child receives all the nutrients he needs (except vitamin D) from mother's milk. The suction movements required to extract the milk provide optimal development for the maxillaries, thus ensuring that there is sufficient space for each tooth and that the teeth will not overlap. Bottle-feeding does not offer this advantage.

First caries and how to prevent them

Usually, caries begin to appear when the child is between the ages of 18 and 24 months. It is important to remember, however, that young children will not necessarily get caries even when all the right conditions are present. Although lactose is a sugar and its concentration in mother's milk is slightly higher than in cow's milk, it is nevertheless the least cariogenic of all sugars and does not cause caries under normal conditions. Rather, the appearance of caries is precipitated by the way the young child is fed, and particularly by what is in the baby bottle and how it is given.

As time goes on, the child's stomach can still handle only small meals, so they must be rich in nutrients. The child should be trained to stop his activities to take time to eat and taste the food. Avoid developing the habit of grazing and drinking out of a bottle throughout the day, which can have detrimental health implications throughout life. For children, the best snack is a glass of milk or fresh fruit, with or without cheese or yogourt. The most detrimental elements in a child's diet are too many drinks of all kinds, even when given in a bottle.

Fermentable carbohydrates

The first foods implicated in the development of caries contained sugar, mostly naturally occurring sucrose (dried fruit), or added sugar (cane sugar). Throughout history, the prevalence of caries increased with the wider availability of sugary foods. We should remember that all the populations in which this phenomenon was observed traditionally had a diet rich in starch, in the form of minimally processed grain products. It appears, therefore, that starch was not a factor in the origin of caries.

With the industrial age, grain products were ground finer. Individuals with fructose intolerance were reported to have a lower caries incidence in comparison with other healthy members of their family, and sometimes no caries at all.

Today, milling is producing increasingly finer textures, and foods are subject to various cooking methods, often at very high temperatures, and sometimes with sugar. Thus processed, the starch molecules become smaller (dextrins) and therefore more likely to be broken down into the glucose stage by the salivary amylase. In addition, the cooking stage changes the product's texture so that it becomes sticky after contact with saliva, and it adheres particularly to the
inter-dental spaces and beneath the gums. When bacteria can metabolize starch and reduce it to sugar, they can produce acid, and the starch becomes a “fermentable carbohydrate”. If, furthermore, even a small quantity of sucrose is added, the caramelization that occurs when the starch is cooked together with the sugar increases the stickiness of the food’s texture to create a substrate that remains available longer to the existing bacteria, thus prolonging the period during which the acid is produced and is able to attack the enamel. In a study conducted with animals, Grenby and Grenby demonstrated that adding sugar to starch makes the mixture more cariogenic than sucrose alone.

Thus we can conclude that starch, when processed in the forms commonly consumed today, is potentially cariogenic. However, traditional foods such as potatoes, rice, pasta, legumes and bread, whose texture requires thorough chewing, and which are all sources of starch, can be considered non-cariogenic, particularly because they are usually eaten with non-carbohydrate foods (proteins and fats) that are not harmful to teeth.

TIPS TO AVOID CARIES IN YOUNG CHILDREN

- Breastfeed the child, even on demand, during the first six months of life.
- If the child is bottle-fed, he should be taken into the caregiver’s arms for the feeding, and then put to bed once he falls asleep, without a bottle or sweetened pacifier.
- Outside of breastfeeding or bottle-feeding times, give a child water to drink without added sugar.
- Limit the use of fruit juice to the amount required to balance the child’s diet. A few ounces a day are enough for a young child. Additional amounts should be in the form of fresh fruit.
- Between bottle feedings, do not give additional bottles containing fruit juice, fruit punch or soft drinks. Their natural acidity fosters decalcification by erosion. This is also true for diet soft drinks, which have an acid pH.
- When the child reaches the age of six months, he should be able to drink out of a training cup. Give him his daily juice with the training cup, which reduces the time his teeth are in contact with the acid.
- If properly done (gradual reduction of frequency with the addition of other foods), breastfeeding or bottle-feeding can be continued after six months. At the age of one, the child should stop using the bottle and be using the training cup. Faster swallowing reduces the contact period with the liquid.
- Do not give teething biscuits. They provide no real benefit and are a food of choice for bacteria.
- When the child begins to have a varied diet, do not give him cookies, candy, pastries, fruit juices, or sweet drinks during the day. Pieces of fruit, cheese, some vegetables, and small sandwiches are better for his health.
Acidic foods

It is important to mention that there is a wide range of foods readily found in children's diets whose inherent acidity contributes directly to demineralization, whether or not they contain sugar. They have a detrimental effect when ingested in conjunction with sugar.

Most fresh fruit have a sugar content of 10 to 15%, which is sufficient to penetrate plaque and be used by bacteria to produce acids. In addition, fruit is an acid food that is able to demineralize the enamel if it remains in prolonged contact with it. The erosion cases reported due to fruit consumption mainly involved individuals who consumed as many as 20 fruit per day, or who sucked on acidic fruit such as oranges or lemons, which had the effect of placing their teeth in direct contact with the acidity of the fruit. This, however, is not the case when a few fresh fruit are eaten in a day, even bananas, which have a slightly higher sugar content and stickier texture. Although the salivary flow that comes from ingesting fresh fruit is enough to neutralize the acid contained in most fruit, eating an apple, for example, does not clean the teeth. A toothbrush and dental floss are still necessary.

One hundred percent natural fruit juices are acid and can cause erosion when drunk slowly or over long periods of time. If ingested in reasonable quantities (and as long as fresh fruit is not neglected, as per the recommendations of Canada's food guide) and fairly quickly, they do not cause damage because of their low sugar content and fluid consistency.

Fruit punch, herbal teas and diet and regular soft drinks are also foods that contain acids that risk eroding tooth enamel. With the exception of herbal teas, their sugar content is comparable to that of natural fruit juice. In the presence of plaque, bacteria could use this sugar to produce acid (caries). Given their low nutritional value, it would be beneficial to limit these drinks as much as possible and ensure that they do not take the place of nutritional foods like milk (Fig. 1).

Sports drinks, while also acidic, have a higher sugar content than other sweet drinks and therefore have sugars that penetrate plaque more easily and become more readily available to bacteria. In addition, because they are more viscous, they stay in longer contact with the teeth. Drinking sports drinks not only increases the risk of caries and erosion, it also deprives children's bodies of important nutrients, particularly calcium. Another negative consequence of over-consumption of sports drinks is their contribution in calories. Since the body does not compensate for the additional liquid calories by ingesting less food, the surplus liquid calories contribute to obesity. Recent studies have established a link between obesity in children and the consumption of soft drinks.

Are certain foods harmless to teeth?

It is appropriate to wonder whether the omnipresence of carbohydrates in our diets makes it impossible for people to have a healthy diet these days, especially one that will not expose the teeth to caries. Fortunately, there are many easily identifiable foods that do not harm teeth and also provide many advantages for physical health in general.
First of all, it is important to know that all foods mainly composed of proteins and fats cannot be used by bacteria to produce acid that attacks tooth enamel, even when they end up as debris between the teeth. This is case namely with meat, game, poultry, fish and eggs, which are part of the meat and alternatives category of Canada’s food guide, and which have a neutral pH in the mouth. As for nuts and seeds, which are also part of this group, they are low in carbohydrates (starches) and are therefore not harmful because they contain proteins and fats. In fact, if eaten after sugary foods, they tend to increase the pH level and neutralize the acid that may have been produced. They are an excellent snack either eaten alone or with a piece of fruit. The last item in this group is legumes. Their composition is similar to that of nuts and seeds, and they contain no processed starch. The sugars they contain are mainly oligosaccharides, so they cause more flatulence than caries ... 

Secondly, taking a look at the vegetables and fruit group, some vegetables, such as corn, contain starches and/or sugars like legumes. This is also the case with carrots, whose low starch/sugar content (< 5%) is not sufficient to penetrate plaque. When carrots are eaten raw or undercooked, saliva is stimulated by chewing and it easily neutralizes the small amount of acid produced. Cooked carrots are usually eaten together with pH-neutral foods from the meat and alternatives group. Earlier we saw that fresh fruit eaten in normal quantities, (fewer than 10 per day), do not present a tangible danger for teeth. There is therefore no need to deprive oneself under the assumption that fruit is acid and contains sugars (Fig. 2).

In the milk products group, milk is the best food for healthy teeth. In fact, its content in lactose, which is the least cariogenic of all sugars, is relatively low, and it contains calcium and phosphate ions that prevent the dissolution of the enamel. Casein, a phosphoprotein in milk, adheres to the surface of the enamel and reduces its solubility. In addition, the fats contained in milk form a thin film on the teeth that, when added to the effect of the casein, delay the penetration of sugars into the plaque. Chocolate milk contains sugar (about 10%) and also cocoa, a substance that has been associated with a reduction in bacterial growth. Added to the characteristics of milk, which we have just mentioned, cocoa neutralizes the negative effects of sugar and makes chocolate milk a non-cariogenic food.

Yogourt is a milk product with less lactose than milk, as a result of fermentation. With or without flavouring (vanilla, lemon, etc.), it has the same characteristics as milk, which can compensate for the added sugar. Yogourt that contains fruit jam is slightly cariogenic (owing to its consistency and sugar content). It is better to eat the first type of yogourt with homemade fruit puree or frozen berry compote, or with fresh fruit. The nutritional value of yogourt, which is good at the outset, will be enhanced by the addition of vitamins and fibre.

Cheese not only has all the characteristics of milk, but also usually contains more calcium and fat. Hard cheese requires more chewing, which increases salivary flow and, consequently, the basic substances in plaque. Eating cheese will bathe the teeth in calcium, phosphate and bicarbonates, which increases the pH of plaque and fosters remineralization. This is why it is good to eat cheese at the end of a meal that contains carbohydrates. As for ice cream, it has some of the desirable characteristics of milk, but in lesser proportions (1/3 of the calcium, phosphate and casein). In addition, it contains more sugars and fats. Its soft consistency and sugar content make it cariogenic, but at a lesser level than other dessert foods. It is a dessert that can be given to children, preferably without a cone or sundae toppings (Fig. 3).

Now we turn to the most problematic group, grain products, which contain carbohydrates that are processed at varying degrees. These products vary widely, depending on how they were processed. Whole grain cereal, eaten with milk, and even with a small amount of sugar, does not pose a problem. More chewing may be required due to its fibre content, which increases salivary flow. The presence of organic phosphates (phytates) hinders the dissolution of the enamel. As for the benefits of other types of cereals, particularly flakes produced by cooking the product at very high temperatures, they are more doubtful because the starchy have been hydrolyzed into smaller molecules of maltose and glucose, which are sugars that can be used by bacteria to produce acid. However, several studies have concluded that when eaten with milk, these types of grains increase the sugar content of a child’s diet but do not appear to increase their risk for caries. However, cereal bars cannot be considered a substitute for cereals. Their chewy consistency breaks down their starches and sugars into the form that is most readily available to bacteria. In addition, they are rather low in protein (Fig. 4).

Whole-wheat breads and other bakery products (white bread, bagels, pita bread and so forth) that require a lot of chewing pose no threat to teeth. Furthermore, pasta and rice have not been linked to caries. The starches in these products are not reduced to large quantities of dextrin, and they are usually eaten with neutral pH foods (meat, fish, cream sauces, etc.).

Foods that harm teeth

Given that the food products on the market change constantly, it is important to be able to easily spot those that may be harmful to teeth. They are often attractively presented, if not by their packaging than by their purported merits.
Our knowledge of the factors associated with the cariogenicity of foods, coupled with the information on food labels (which have become mandatory on pre-packaged food since January 2006) can help us select appropriate foods by supplying us with the answers to a series of simple questions on the composition of the food and the way we plan to eat it.

**The simplest and safest answer** to all these questions is to choose foods that have been processed as little as possible, i.e., milk products, vegetables and fruit, and grain products. They are the best choices we can make for a healthy diet as recommended by Canada’s Food Guide. Most of them have excellent nutritional value and do not contribute the additional calories that few people really need. Most require little or no cooking, which makes them the perfect fast foods. The foods that can be harmful to teeth are also harmful to our health in general. They all contain fermentable carbohydrates and are concentrated sources of energy (for example, pastries and candy). Since they contribute few or no essential nutrients, they should be passed up, and our health will be all the better for it. But if we do give in to these indulgences, we should limit how often we eat them and follow the above eating guide to minimize their harmful effects.

**The worst offenders are:**
- All types of cookies
- Pastries and sticky bakery products
- Acidic drinks of all sorts, diet or not. Unfortunately, they seem to be taking the place of milk.

**QUESTIONS TO HELP DETERMINE THE CARIOGENICITY OF FOOD**

- What are its ingredients? If it contains mainly fats and/or protein, it is not cariogenic.
- If it contains carbohydrates, are they in the form of sugar or starch?
- What is the food’s sugar content? For example, 10g of sugar in a product that weighs 15g is a content of 66%.
- Does the product contain starch that has been cooked at high temperatures? Does it also contain sugar, even in small quantities?
- Does the product have a chewy consistency, which might make it adhere to the teeth and become lodged in places where it is difficult to remove?
- Is it an acidic food that can directly cause erosion?
- Is it eaten only occasionally or frequently? Can we avoid nibbling or sipping it?
- Is it a food that is usually eaten alone? Can we eat cheese or nuts after eating this food in order to reduce its negative effects?

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