

Nutrition and Its Importance in Dental Health

Raymond L. Braham, BDS, MScD, Paul R. Barkin, DDS,
Merle E. Morris, DDS, MS, and Michael W. Roberts, DDS, MScD

San Francisco, California and Washington, DC

Balanced and good nutrition is necessary for the growth, development, and maintenance of the dental and oral structures. Nutrition counseling is, therefore, of paramount importance. The physician who is aware of the factors that cause dental and oral disease will be in a position to intercept the progress of dental caries caused by an incorrect diet. This paper considers the significance of highly cariogenic foods, particularly sucrose, and the difficulties of removing it from the diet. A method of conducting a diet survey is presented. The importance of fluoridation is discussed, with elaboration of the advisable prescribing techniques for fluoride supplementation of the diet. Cooperation between physician and dentist is important in order to insure the prevention of dental disease.

In the 1970s the major thrust of dentistry has turned to prevention, following the lead set by its medical counterpart. Prevention in dentistry is not all that new. What is new is the pragmatic and objective approach that has been adopted. One example of this preventive approach is nutrition counseling in the dental office.

Preventive dentistry has reached its present state as an art and science as a result of the work of basic scientists who have shed considerable light on the nature, causes, and mechanisms that produce oral disease. The oral microbiologist has identified the optimal nutrient needs for the cariogenic microflora of dental plaque. (Dental plaque is a tenacious film or mass of microbes that adheres to the enamel surface of the teeth in a gelatinous matrix. Eighty percent of plaque is water and the rest is salivary protein, desquamated epithelial cells, and plain debris. It also contains the bacterial enzymes that convert sugars to lactic acid.) The physical chemist has explained the caries-inhibiting mechanism of fluoride action as resulting from its ability to stabilize the microscopic structure of tooth enamel; and the nutritional biochemist has explained the high

From the Department of Growth and Development, School of Dentistry, University of California, San Francisco, and the Dental Department, US Public Health Service, Washington, D.C. Requests for reprints should be addressed to Dr. Raymond L. Braham, Assistant Professor of Pediatric Dentistry, School of Dentistry, 630-S, University of California, San Francisco, CA 94143.

cariogenic potential of sucrose on the basis of its physiochemical properties.¹

Diet and its Role in the Control of Dental Caries

When a dentist speaks of diet, he/she is most concerned with the diet preferred by bacteria in the mouth. Although correct nutrition is necessary to provide and maintain good general health, including dental health, it is the local action of bacteria and their substrate that most concerns dentists. This substrate is refined carbohydrate, of which the best utilized is sucrose. While sucrose alone is dangerous to dental health, a combination of sucrose and other refined carbohydrates, such as baked confections, is the worst for the patient (and conversely the best for the bacteria).

Historically, sugar has had very desirable uses. Once man had found a sweet taste he was very loathe to let go. Sugar has, in effect, become a food with emotional connotations. Parents may use it as a reward, or more correctly a bribe, for their children: "Eat your vegetables and then you may have your dessert." It is an expression of affection in all age groups: "Sweetie," "Sweetheart," "Sweets to the Sweet," "Honey," "Sugar." It may, indeed, be the only way some people can express their affection. Because of its historical desirability and emotional implications, the dentist may expect resistance in his attempt to have patients restrict their sugar intake.

Sugar is rampant in the commercial and home preparation of foods. A bowl of corn flakes, with no sugar added, may consist of four to seven teaspoons of sugar! Canned fruits, vegetables, and juices have high sugar content. Bread is usually baked with sugar. Peanut butter is, in most instances, made with sugar. Salad dressing made at home may include sugar to prevent its being too tart.

Thus sugar ingestion by patients is a problem for the dentist as much as smoking is for the physician. Children and, most importantly, their parents have to be convinced that it is in their own best interests to control and limit the amount of

daily intake of sugar. The prime factor that motivates patients to accept dietary advice is that the dentist himself must have a *deep conviction* that this is a *meaningful* method of dealing with the most manageable of the fundamental causative agents in dental caries production, namely, food. This conviction will be strengthened by acquaintance with various studies that bear out the fact that nutritional counseling is an effective means of controlling dental caries.^{2,3} Howe et al demonstrated that children who followed dietary instructions by eating foods of high nutritional quality, simultaneously decreasing their intake of excessive carbohydrates, had 50 percent less tooth decay than a control group who were not counseled.⁴

The patient will be motivated to cooperate if an appeal is made to his or her other esthetic and health values. Scarcely a teenage girl will not want to make herself attractive by attaining a pretty smile, clear skin, and slim figure, nor are there many teenage boys who do not want firm muscles and plenty of energy. Yet another means of motivating patients is the assurance of significantly less future need of dental services, which means less pain, less expense, less loss of time, and less inconvenience.

If the patient can understand that the dentist wishes to help reduce cavities while permitting the patient to enjoy his food, then success, as measured by dental disease reduction, will be much more easily achieved.

The dentist must first know the patient's daily intake of food. This can best be achieved through a diet survey (Figure 1). It must be complete, even to brand names if possible. The parent and child can be helped to understand that accurate and detailed knowledge is required.

The first evaluation of the diet survey is for general nutrition (Figure 2). Placing a tally mark in each of the four basic food groups for seven days, then averaging each group, and comparing with the suggested daily amounts will show where the patient is lacking or adequate in the daily intake. Once this is graphically displayed, the mother can best be advised how to provide and maintain good nutrition for dental health.

One major difficulty is the diet reflecting ethnic preferences. The family might not be willing to exchange the habits of years and the familiarity with a preferred diet. One such diet and the devas-

Figure 1. Food Intake Survey

FOOD INTAKE DIARY	FIRST DAY			SECOND DAY		
Of: _____	Food:	Quantity:	Prepared:	Food:	Quantity:	Prepared:
For The Ten Days (include one WEEKEND or a HOLIDAY)	BREAKFAST:			BREAKFAST:		
INSTRUCTIONS	10:00 A.M.			10:00 A.M.		
1. Please record in detail everything you eat or drink. This includes between meal snacks, candies, gum as well as regular meals.	LUNCH:			LUNCH:		
2. The following should be included:	3:00 P.M.			3:00 P.M.		
a. The kind of food (chicken, apple, bread, etc.)	DINNER:			DINNER:		
b. The approximate amount in household measures (1 cup—8 oz.; 1 T—tablespoon)	Extras:			Extras:		
c. The preparation (raw, cooked, fried, etc.)						
d. The order in which they are eaten at the meal						
e. The number of teaspoons of sugar or sugar products eaten as well as milk added to cereal, beverages or other foods.						
3. Particular information is essential on the time and frequency that between meal snacks are eaten.						

Figure 2. Basic Foods

Instruction: Place a tally mark in the appropriate block for each food item in diet survey.

FOOD GROUP	PORTION SIZE CONSIDERED ONE SERVING	1st Day	2nd Day	3rd Day	4th Day	5th Day	6th Day	7th Day	Average	SUGGESTED DAILY AMOUNT	DIFFERENCE
MILK (Milk & Cheese)	8 oz. (1 cup) milk 1½ oz. Cheddar Cheese 1½ slices American Cheese 1½ cup cottage cheese									3-4 serv.	
MEAT (meat, fish poultry, nuts, dry beans)	2-3 oz. lean cooked meat, fish or poultry 2 eggs 4 T. peanut butter 1 cup cooked dry beans or lentils									2 or more serv. (2-3 oz. each)	
FRUITS and VEGETABLES (including citrus fruit, dark green & deep yellow vegetables)	½ cup cooked 1 med. raw ½ med. grapefruit or cantaloupe 4 oz. (½ cup) fruit juice									4 or more serv.	
BREADS and CEREALS (enriched or whole grain)	1 slice bread ¾ cup dry cereal ½ cup cooked cereal, rice, noodles, macaroni									4 or more serv.	

COMMENTS:

tating results it can produce, and which is frequently encountered in California, is that of immigrants from the Philippine Islands. Because of the socioeconomic conditions in that area the basic diet that is fed to the newly weaned infant consists of brown or raw sugar dissolved in carabao (water buffalo) milk in the nursing bottle. Once the bottle is dispensed with, the basic diet becomes rice and cereal which is heavily laced with the same brown or raw sugar. Feeding the baby this way results, very frequently, in a condition which is also seen when a mother gives her baby a bottle of sweetened milk or fruit juice to go to sleep with at night; some mothers even go so far as to place a pacifier dipped in honey in the baby's mouth either at night or to keep the baby quiet during the day. The condition is known under various names: "Nursing Bottle Caries," "Baby Bottle Syndrome," "Milk Bottle Caries." It is characterized by carious breakdown of the maxillary primary central and lateral incisors as well as the maxillary and mandibular first primary molars, all prior to the age of 16 months. The reason for this is that the primary cuspid (canine) and second primary molar teeth erupt after this time. The mother places the nursing bottle laced with a thick sugary mix in the baby's mouth and the baby goes to sleep with a pool of the mixture around the maxillary incisors and primary molars. The mandibular incisors are protected by the tongue which is in the infantile sucking position. Every so often the baby takes a deep breath or another suck on the bottle or gives a cry, and a fresh pool of the sugar solution is drawn around the teeth in question. The effects of this highly cariogenic solution puddling around the teeth all night leave little to the imagination. Figure 3 illustrates early nursing bottle caries, Figure 4 the advanced state, and Figure 5 shows the reconstruction with stainless steel crowns that can be carried out, provided the dentist catches it before the situation has proceeded to abscess formation. Needless to say, at this early age, the management problem necessitates the risk, time, and expense of an average of three hours in the Operating Room with general anesthesia.

The dentist may try to effect a change for the better, but he should be prepared to give recommendations gradually without immediate hope of their being followed completely. Success is more likely if the parents find out that good nutrition need not be as expensive as their current diet.

Some people desire more expensive foods because they are thought to be of higher social level, even though they may be of less nutritional value (a "keeping up with the Joneses" principle!). Fortunately this attitude is slowly changing. Even so, steak is preferred to hamburger, and peanut butter—a high protein food—does not have the social status of meat. The patient should not interpret a recommendation for peanut butter as one for peanut butter and jelly.

The Diet History—Attainment and Evaluation

The diet survey should cover a period of at least a week or ten days when the patient is living under ordinary circumstances. For example, a child at boarding school should not be assessed when home on a visit nor when normal eating patterns are obscured, such as during a holiday season. No attempt should be made, prior to the survey, to communicate to the patient or parent any information that might influence the normal dietary pattern. All recommendations will be made on the basis of the dietary evaluation.

Information that should be readily available from the diet history includes: the nature of the food eaten, an estimate of the quantity of food eaten, the approximate time at which it is eaten, the order in which it is eaten and, if possible, information as to how the food was prepared. In reviewing the diet report special attention should be paid to the presence of retentive fermentable carbohydrates, the frequency of carbohydrate ingestion, the presence of "hidden sugars," eg, those used to flavor pastries, cakes, sauces. Although the dentist is checking the diet for the presence of sucrose it must be borne in mind that polysaccharides, monosaccharides, and disaccharides are all potential caries-provoking agents. Special attention should be paid to products containing refined flour, cane sugar, and syrups. Foods with high natural sugar contents, such as honey and maple syrup, should be noted as carefully as refined sugars. All sugars and sugar-containing foods can be underlined in red to show the patient the frequency of sugar intake. Dried fruits such as figs, dates, prunes, apricots, and raisins should be noted, since their sugar content

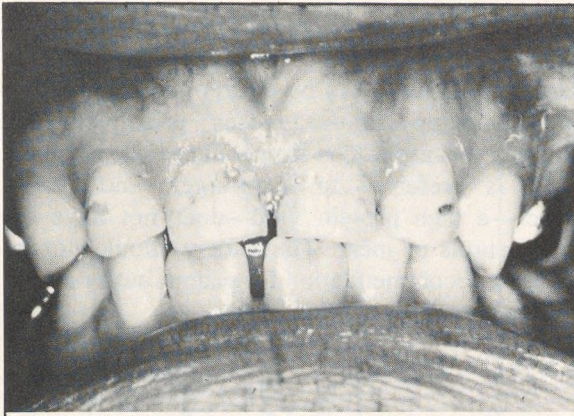


Figure 3. Early "Nursing Bottle Caries." Note the carious lesions in the labial surfaces of the maxillary primary central and lateral incisors.

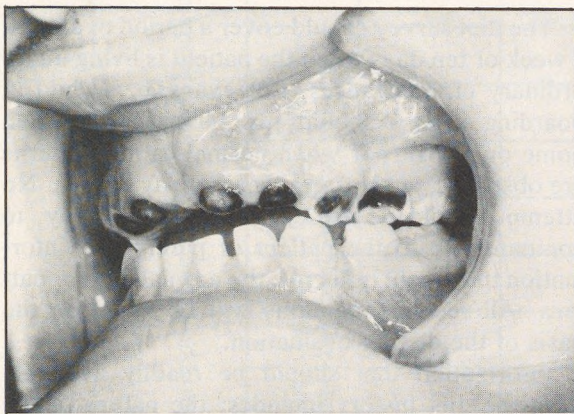


Figure 4. Advanced "Nursing Bottle Caries." All the maxillary primary anterior teeth have been destroyed to the level of the gingivae. The mandibular primary anterior teeth are unaffected but the mandibular left first primary molar is cariously involved.

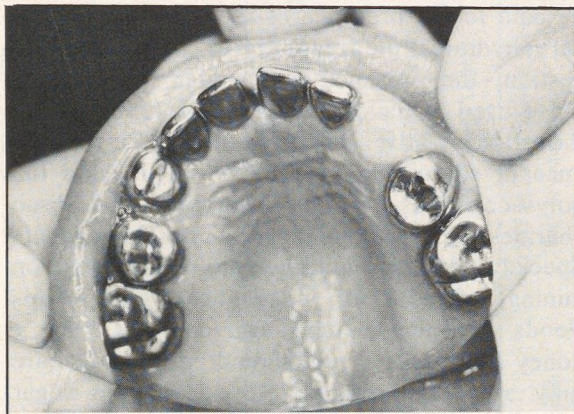


Figure 5. A grossly cariously broken-down maxillary dentition of a three-year-old child which has been restored with stainless steel crowns.

can be so concentrated as to be almost crystalline! However, fresh fruits such as apples, oranges, and pears are not underlined. The dentist and parent can learn to read the fine print on labels to find sucrose, and the dentist should know the amounts of hidden sugars in foods. Of special importance is the frequency of eating before retiring at night, since the clearance of such retained foods will not be assisted during sleep by normal daytime salivary flow.

Once the patient's nutrition and sucrose intake has been assessed the dentist can make his recommendations for diet changes to the patient and/or parents. It must be emphasized that the ultimate responsibility belongs to the family. Using "Snack Foods" (Table 1) as a guide, the dentist can again point out basic nutritional needs and suggest ways to augment these, as well as suggest enjoyable snack foods that are not cariogenic. Present evidence does not contraindicate such things as potato chips, peanuts, and chewing gum, provided the latter is sugar free.

The restriction of sugar in the patient's diet may be based upon the caries activity level. Certainly a child who displays little or no plaque, no dental caries, and no gingivitis can be permitted a higher sucrose intake than one with rampant caries and generalized gingivitis. The child's age has a strong bearing on his permitted intake of sucrose. Since 80 percent of the total incidence of the average patient's carious lesions occur in the teenage years, this is the period when sucrose intake should be kept very low. The period from four to six years is also a peak time when caries incidence is on the rise, and sugar intake should be decreased.

The manner of controlling sucrose intake in the diet can be based upon the parent's and child's disciplinary patterns. Sometimes the authoritative approach is the best to insure success, but more often convincing the parents in order that they will encourage in the child their own self-discipline is far more effective.

If the dentist can inform the family and share other families' successful methods, there will be much more success. It is possible to have a sweet tooth without sucrose through the use of artificial sweeteners. Granted the situation over saccharine is one of total chaos at the moment, but sorbitol has shown considerable promise, and others are under investigation.

Effects of Food Factors in Caries Production

Frequency of Sugar Intake: The classic study that first demonstrated the importance of between-meal sweet consumption in caries production was the Vipeholm Study.⁵ This was a long-term, carefully controlled study which demonstrated that if sugar with only a slight tendency to be retained, such as sucrose solution, was ingested at meals or if sugar-rich bread which has a strong tendency to be retained was consumed *at meals*, the risk of increasing caries activity was *least*. However, when sugar with a strong tendency to be retained was eaten between meals frequently, the risk of increasing caries activity was *greatest*. Lundqvist⁶ measured the time sugar could be detected in the saliva of the participants in the Vipeholm Study. Regardless of whether it was the control or the bread or the sucrose group, of those groups who ingested sugar at mealtimes, only four peaks of sugar in the saliva were noted, corresponding to the four meals. It was also noted that those groups who ate twice as much sucrose as the control group (but at mealtimes only) showed an identical salivary glucose level.

Gustafsson's Vipeholm Study and Lundqvist's results proved several points: sugar exerts its caries-promoting effect locally in the mouth; starchy foods like bread are less cariogenic than sucrose; the amount of sugar is not of paramount importance; the form and composition of the sweets are critical (retentive worse than nonretentive); and the frequency of usage is a major factor in caries incidence.

Fluoridation

The fluoridation of communal water systems is the greatest weapon in the fight to reduce the prevalence of dental caries in the general population. In study after study since the early 1940s, water fluoridation has resulted in a decrease of caries incidence by 60 to 65 percent.⁷⁻⁹ No other measure available, applied to the general population, can approach such a level of protection. It behooves the health-care professions, therefore, to work diligently and vigorously to insure that the benefits of water fluoridation are made available to the entire population.

Supplemental Fluorides

How to bring the benefits derived from fluoride ingestion to those whose water supply is not fluoridated has received considerable attention. The use of supplemental fluoride is, however, no substitute for water fluoridation for several reasons: Water fluoridation (1) makes the fluoride ion available to all children residing in the area served by the water supply, (2) requires no conscious and sustained effort on the part of the individual, and (3) automatically restricts the dosage of fluoride to levels which have been proven safe for everyone.

Indications for Supplemental Fluoridation of the Diet

Raising the level of dietary fluoride should be considered when the existing domestic water supply has a fluoride concentration of less than 0.7 parts per million, *and* if the child's health is of intense parental concern. (If the parents are not extremely concerned about the child's dental health there will be little possibility that the tablets will be administered on a regular basis, thus nullifying any positive effect that they might otherwise have.) One study involving highly-motivated health-care professionals showed that even among this socioeconomic group, family cooperation was poor.

Guidelines for Prescribing Supplemental Fluorides

The most important factor to consider when contemplating the prescription of fluoride supplements for home use is the concentration of fluoride in the drinking water. Fluoride content of nonfluoridated public water supplies and private sources, ie, wells, etc, varies considerably with differing amounts of fluoride from the earth's crust. In some areas the fluoride content is at an optimal one part per million on a naturally occurring basis. When the fluoride content of the home or school water supply is unknown, samples should be analyzed. Public health officials can supply a plastic container in which to furnish a sample for analysis (glass is unsuitable as fluoride is adsorbed by the glass, resulting in incorrect

Table 1. Snack Foods

<p>Foods to be recommended:</p> <p><i>Milk group</i> Milk, cheese.</p> <p><i>Meat group</i> Luncheon meats, nuts of all kinds, salami, smoked sausage.</p> <p><i>Fruit & vegetable group</i> Raw fruits, such as oranges, grapefruit, peaches, pears, apples. Raw vegetables, such as carrots, celery, cucumbers, lettuce, tomatoes, salad greens, green peppers. Unsweetened fruit juices, tomato or vegetable juices.</p> <p><i>Bread and cereal group</i> Crackers, toast, pretzels, corn chips.</p>	
Snacks	
Recommend	Avoid
<p>Potato Chips Corn chips Corn curls Pretzels Cheese curls Popcorn (buttered) Cheese dips Onion dips Clam dips Hard roll cheese and/or meat sandwich Oranges</p>	<p>Candy Cake Cookies Pie Pastry Ice cream sundaes Ice cream cones Caramel popcorn Candy apples Peanut butter and jelly sandwiches Honey graham crackers Dried fruits, raisins</p>

measurements).

In determining how much fluoride supplement to prescribe, it is important to consider the patient's age. The most recent evidence indicates that there is little value in prescribing fluoride supplements to children under the age of six months.¹⁰ Information has, indeed, recently come to light which suggests that previously recommended dosage schedules may provide greater amounts of fluoride than are desirable, resulting in possible mottling of the teeth.^{11,12}

Therefore, based upon the amounts of fluoride the infant receives from various foods,¹³ and the difficulty in determining the appropriate daily dosage for infants, it is not advisable to begin fluoride supplementation for infants until after six months of age.¹⁴ Table 2, which considers both age and water fluoridation levels, gives dosage recom-

mendations for patients from six months to six years of age. When the body mass is small—until the age of three years—reduced amounts of fluoride are recommended. After the age of three the dosage is increased. Reference to Table 2 will show that present recommendations are a maximal daily dose of fluoride (0.05 mg/kg body weight/day), being 0.25 mg for infants and children from 6 to 18 months of age; 0.5 mg from 18 months to 3 years of age; and 0.75 mg from three to six years of age; with 1.0 mg after six years of age. Fluoride supplementation should continue through to the time of eruption of the second permanent molars, at approximately the age of 12, which marks the presence of the full permanent dentition (with the exception of the third permanent molars, or so-called Wisdom teeth, which do not usually erupt until approximately 18 to 21 years of age).

Fluoride Concentration of Water Supply (PPM)	Desirable Fluoride Supplementation (mg/day)				
	Age				
	0-6 mon	6-18 mon	18-36 mon	3-6 years	6 years
0.2	0*	0.25	0.50	0.75	1.00
0.2 - 0.4	0*	0*	0.25	0.50	0.75
0.4 - 0.6	0*	0*	0	0.25	0.50
0.6 - 0.8	0*	0*	0	0	0.25
0.8	0*	0*	0	0	0**

*0.25 mg for fully breastfed infants.
 **In this age group, the hazard of fluorosis is low and some additional protection will probably be afforded by fluoride supplementation. However, fluoride supplementation is probably not desirable when drinking water supplies provide more than 1.1 ppm.
 †From Fomon SJ: Nutritional Disorders of Children: Prevention, Screening, and Followup. DHEW publication HSA 76-5612, US Government Printing Office, 1976.

Types of Fluoride Supplements and Their Selection

Fluoride supplements are available as liquid solutions, tablets, lozenges, and fluoride-vitamin combination preparations. The major factors in deciding which form to prescribe are the age and development of the individual patient.

Liquid Fluoride Solutions

For infants and children not old enough to manage the tablet form, neutral sodium fluoride solutions which can be dispensed with a medicine dropper are the most convenient form to prescribe, and the dosage per drop is specified on the label. For children over three years of age the tablets or lozenges are more suitable. However, when water fluoride content necessitates careful proportioning, the drops should be used and the dentist should indicate the requisite number of drops.

Fluoride Tablets

Fluoride is available in tablet and lozenge form. The most commonly prescribed form is the chewable tablet. It is felt that the action of chewing the tablet prior to swallowing it provides the added benefit of a topical application to the teeth prior to the systemic action. Neutral sodium fluoride tablets are available as are tablets of acidulated phosphate fluoride (APF). There have been no tests to directly compare the activities of these two types of tablets. Separate studies have documented the successful anticaries effects of each. The American Dental Association Council on Dental Therapeutics has warned that not more than 264 mg of fluoride should be prescribed at any one time.

Fluoride-Vitamin Combination Tablets

Many times, supplemental fluorides are com-

bined with vitamins in one tablet. Clinical studies have failed to show any additional effect of vitamins on the decay-prevention properties of fluoride per se; however, this combination enhances the probability of the child taking the preparation on a regular basis. There are, however, associated problems. There is the risk of hypervitaminosis, especially with regard to vitamin D, when a child is on a well-balanced diet. As a consequence it is not the dentist's prerogative to prescribe vitamin supplements; rather this is the physician's responsibility. If, however, the physician determines that vitamin supplements are indicated, the vitamins and supplemental fluorides are best administered separately since, human nature being what it is, the mother may omit one or more doses and think that it can be corrected by giving more on a subsequent occasion. This is not so and may lead to all sorts of complications and problems.

Patient Education

To receive optimal benefits, patients and parents should be taught the proper use of fluoride supplements. Since the condition of the mouth at the time of ingestion, without a doubt, affects the uptake of the fluoride it is recommended that patients brush their teeth and use dental floss before they use fluoride supplements. Unwaxed dental floss should be recommended in preference to the waxed form which tends to leave a smear of wax on the interproximal surfaces of the teeth, thereby insulating them against the topical effect of chewing the fluoride supplements. It is best to advise the patient not to rinse, drink, or eat for a period of 30 minutes after ingestion. Fluoride supplements show their best results when taken directly before retiring since there is less chance of their being diluted by subsequent food or drink.

Maintenance of Prevention

With all the tools available to modern dentistry for combating dental disease and working for its prevention, there is still no way to rid the mouth of cariogenic bacteria. Constant vigilance is the only defense against the ravages of dental disease. The physician and dentist must use all their influence to have the parent and child maintain preventive care. Until the day when chemicals or antibiotics are available, mechanical means remain the most

effective way of removing dental plaque. Disclosing tablets and solutions should be used to reveal the areas of plaque buildup on the teeth. Toothbrushing is effective for almost all surfaces, but the interproximal areas must be cleaned with dental floss (unwaxed, as previously stipulated). Other devices, such as soft-wood points, can be used as aids but any of these devices used to excess may damage the teeth or gums; everything must be in moderation and no technique is clearly better than another. The critical areas to be cleaned are the gingival sulcus and the interproximal area. It is all too easy, and only human, to let discipline relax. Only the use of recall examinations and periodic reviews of preventive techniques, and the enthusiasm of all involved health-care personnel will persuade the parent and child to maintain the high level of continued effort necessary in the fight against dental disease.

References

1. Nizel AE: Nutrition in Preventive Dentistry: Science and Practice. Philadelphia, WB Saunders, 1972
2. Jay P: The role of sugar in the etiology of caries. *J Am Dent Assoc* 29:2012, 1948
3. Becks H: Carbohydrate restriction in the prevention of dental caries using the LA count as one index. *J Calif Dent Assoc* 26:53, 1950
4. Howe RP, White RL, Elliot MD: The influence of nutritional supervision on dental caries. *J Am Dent Assoc* 29:38, 1942
5. Gustaffson BE, Quensel CE, Lonke L, et al: The Vipeholm dental caries study: Effect of different levels of carbohydrate intakes on caries activity in 436 individuals observed for 5 years. *Acta Odontol Scand* 11:232, 1954
6. Lundqvist C: Oral sugar clearance: Its influence on dental caries activity. *Odontol Revy* 3(Suppl 1):5, 1952
7. Ast DB, Smith DJ, Wochs B, et al: Newburgh-Kingston caries fluorine study: XIV. Combined clinical and roentgenographic dental finding after ten years of fluoride experience. *J Am Dent Assoc* 52:314, 1956
8. Hayes RL, Littleton NW, White CL: Post-eruptive effect of fluoridation on first permanent molars of children in Grand Rapids, Michigan. *Am J Pub Health* 47:192, 1957
9. Hutton WL, Linscott BW, Williams DB: The Brantford fluorine experiment: Interim report after 5 years of water fluoridation. *Can J Public Health* 42:81, 1951
10. Nowak AJ, Casamassimo PS, McTigue DJ: Prevention of dental disease from nine months in utero to eruption of the first tooth. *J Am Soc Prevent Dent* 23:6, 1976
11. Aasenden R, Peebles TC: Effects of fluoride supplementation from birth on human deciduous and permanent teeth. *Arch Oral Biol* 19:321, 1974
12. Infante PF: Dietary fluoride intake from supplements and commercial water supplies. *Am J Dis Child* 129:855, 1975
13. Wiatrowski E, Kramer L, Osis D, et al: Dietary fluoride intake of infants. *Pediatrics* 55:517, 1975
14. Fomon SJ, Wei SHY: Prevention of dental caries. In Fomon SJ (ed): Nutritional Disorders of Children: Prevention, Screening, and Followup. DHEW publication HSA 76-5612, US Government Printing Office, 1976