

# CARIES CONTROL REGIMEN

**Martin L. MacIntyre, A.B., D.D.S., M.P.H.**  
**Original 9/1991; revised 9/1998 and 10/2012**

## INTRODUCTION AND RATIONALE

Five (5) caries types are defined, with corollary treatment regimens that will arrest dental caries and prevent recurrence. Fourteen (14) procedures or agents are used. For TYPE I patients only four (4) are needed, of which two (2) are patient controlled (home care) and two (2) are clinician controlled (office procedures). On the chart, only new procedures are listed for the next higher caries type. For example, in TYPE II patients, only #s 5-7 are listed, but #s 1-7 are to be applied.

Maximum success requires individualized diagnosis and treatment. Other factors that might alter the regimen are listed to alert the clinician to these possibilities, but specific changes in the treatment plan are not provided. Alterations require a thorough understanding of:

- 1) The caries process
- 2) The action and interaction of each agent or procedure
- 3) Most importantly - the patient.

Use the regimen unaltered and make adjustments based on your knowledge and experience.

Active, visible caries automatically places the patient into CARIES TYPE III or IV. However, a patient can be these types without visible signs of caries. The risk factors are obtained from objective assessment of a saliva specimen. The patient's caries type can be altered by clinical judgment using subjective factors which, although important, are difficult to verify or correlate, e.g. diet and oral hygiene. The Caries Control Regimen chart is a summary of the procedures, agents, treatment location, methods, conditions and recall periods. Risk factors, altering factors, and abbreviations are also included. The caries types are described in greater detail followed by a brief description of the fourteen (14) procedures and their application.

1. TYPE "O" patients have never had caries and have no risk factors. Many children and a few adults are TYPE O. Purists will say there is no such adult and that signs of demineralization can be found on the mesial of almost all permanent first mandibular molars. Therefore, TYPES 'O' and 'I' receive the same treatment.
2. TYPE "I" patients have not developed new caries or had progression of an existing lesion for the last 5 years AND have no more than one (1) risk factor. Do not try to change their home care with respect to caries risk until there is an increase in their caries risk. However, any office procedure that can reduce a risk factor should be used. The frequency of radiographs for caries detection can be reduced by monitoring risk factors with saliva tests.
3. TYPE "II" patients have not developed new caries or had progression of an existing lesion for the last 4 years OR they have two (2) risk factors. The treatment plan is directed toward high risk sites using antibacterial and remineralization treatments. If there is no salivary secretion risk, then flossing posterior contacts with chlorhexidine (CHX) and fluoride (F-) will be sufficient home care. It is assumed that the preventive measures over the last 4 years have been effective, but now is not the time to relax. The regimen maximizes preventive treatment at biannual office visits and a home program that maximizes the effect of minimum effort.

4. TYPE "III" patients have had visible, active caries within the last 3 years, OR have three (3) or more risk factors. It is important for the patient to be convinced that there is a major problem and that the problem will continue indefinitely, regardless of professional restorative or preventive treatments, unless he makes some positive behavioral changes. It is counterproductive to use the authoritative approach e.g., "if you don't follow my recommendations you will end up with dentures". The clinician's role is to convince the patient to change through the use of the diagnostic tests that graphically demonstrate the problem and that it is possible to improve the test results with short-term office and home treatments. The recommended treatment plan will control caries risk factors. The Type III patient has a history of recurrent caries while under the care of a dentist, i.e. between scheduled exams. The cyclic pattern is frustrating for the patient and even more so for the clinician. This cycle can only be broken by a major caries control treatment and counseling effort. Everything that can be done in the operatory should be done, since it is under the clinician's direct control. It is important to initiate preventive treatment on the same day as the examination appointment. This demonstrates the seriousness of the problem and the potential for success. To depend on a change in the patient's behavior to achieve initial success is to guarantee failure. The last thing likely to be changed is the patient's behavior. At the same time, quick, demonstrable, positive results are a major factor in changing the patient's behavior.
  
5. TYPE "IV" patients have one or more factors that are extremely difficult, if not impossible, to eliminate or change. The most common factor is low or no saliva secretion as a result of disease or medication. Another example is orthodontic appliances. Dietary patterns related to medical conditions can increase caries risk, e.g. frequent small feedings by pregnant women to counteract nausea. Most cariogenic dietary habits are deep seated and are extremely difficult to change. These problems can be managed IF the patient and clinician (including the physician) are willing to make the effort. A patient may not be able or willing to use one of the treatment modalities, e.g. CHX due to staining, but alternatives can be devised that separately are less effective, but in combination are equally effective. Most of these patients will need a regimen that they can continue on a daily basis for the rest of their lives.

**CARIES CONTROL REGIMEN**

CARIES TYPE				PROCEDURE/ AGENT	SITE	METHODS	CONDITIONS	RECALL
IV	III	II	I	1 Saliva Tests 2 F-/AntiBtToothpaste 3 GIC →Bis-GMA 4 Diet Control	C H C H	Specimen Cup Floss/Brush Sealant/F- Food/Drink	periodic examinations bid - am & hs upon eruption → prn ≤5qd & 2+hr bet. & no snacks	1 - 3 years Exception: Age 0-13 6 - 12 months
				5 Sugarless Gum 6 F- reservoir 7 CHX gel/Rn	H H H	Chewing GIC Rn/Floss/Brush	pc if no TMJ symptoms risk sites qid until ↓ risk → floss hs	6 months
				8 GIC 9 Restorations	C C	Temporary Definitive	Grade 3 or 4 caries 1-3 mo after III-8	1 - 6 months
				10 CaCO <sub>3</sub> 11 Saliva-synthetic 12 Sugar Substitute 13 Water	H H H H	Rinse/Brush Spray Meals/Snacks Drinking	prn saliva pH <6.0 after CaCO <sub>3</sub> application whenever feasible qid bet. meals for SSR	1 - 3 months

- 0 - Never had caries and no risk factors
- I - No caries for the last 5 years AND no more than 1 risk factor
- II - Active caries within the last 4 years OR 2 risk factors
- III - Active caries within the last 3 years OR 3 or more risk factors
- IV - Active caries in the last 3 years AND 3 or more risk factors OR irreversible risk factor
- ? WHEN IN DOUBT, SELECT THE HIGHER CATEGORY

OBJECTIVE SALIVA RISK FACTORS FOR DENTAL CARIES

1. Sugar/chewing stimulated saliva secretion rate ml/min (SSR)
2. Buffering capacity (BC)
3. 15 minutes sugar stimulated saliva acid level (ST)
4. Streptococcus mutans (SM) plus Lactobacilli (Lb) counts

SUBJECTIVE FACTORS: sugar intake; feeding frequency; oral hygiene

FACTORS THAT MIGHT ALTER THE REGIMEN

1. Carious lesions:
  - a. symptoms
  - b. number
  - c. rate of caries progression
  - d. proximity of pulp
  - e. location (tooth & surface)
  - f. physical characteristics
2. Enamel maturity (degree of mineralization)
3. DMFT/DMFS incidence and prevalence
4. Fluoride utilization history
5. Success of the previous treatment(s)
6. Medical conditions and medications
7. Age of patient
8. Patient cooperation

ABBREVIATIONS

<b>GIC</b>	glass ionomer cement	<b>F-</b>	fluoride	<b>ac</b>	before meals	<b>bid</b>	2 times daily
<b>Bis-GMA</b>	e.g. Delton, Heliocel	<b>C</b>	clinic	<b>pc</b>	after meals	<b>tid</b>	3 times daily
<b>CHX</b>	chlorhexidine	<b>H</b>	home	<b>hs</b>	before sleep	<b>qid</b>	4 times daily
<b>CaCO<sub>3</sub></b>	calcium carbonate	<b>qd</b>	daily	<b>w</b>	with	≥ ≤	or equal to
<b>SSR</b>	saliva secretion rate	<b>Bt</b>	bacteria	→	then	>	greater than
		<b>Rn</b>	rinse	↓	reduced	<	less than

## PROCEDURES, AGENTS, APPLICATION METHODS AND CONDITIONS

### 1. SALIVA TESTS

A non-invasive caries-risk test battery can identify problems and changes in risk before they are detectable by x-ray or visual examination. This permits non-invasive treatment to be initiated before surgical treatment is required. While x-rays can identify lesions prior to irreversible damage, a minimum of 30% of the enamel mineral is lost before it can be seen on the highest quality radiograph. A few simple tests on a saliva specimen can identify a change in caries risk. The two simplest tests are buffering capacity and saliva secretion rate. These tests measure resistance. The pathogenic challenge is measured by bacterial culturing. A combination of resistance and challenge is measured by the Sugar Snack Test (SST). This test simulates a sucrose snack and measures the outcome of the resistance factors in the saliva vs. the challenge of the pathogenic bacteria. For TYPE I patients the test results can reduce the frequency of standard bitewing radiographs, confirm continuing low risk and monitor the effect of anticaries treatments. Patients can check themselves with a home SST self-test for biofeedback and to adjust the type and frequency of home care. Clinic time can be saved by having the patient report by phone or bring the results with them to their appointment. The frequency of re-testing depends upon the disease severity, the response to treatment and the patient's cooperation in self-testing. If you think this test might be a little simplistic then you might want to read the article at [www.gcindidental.com/images/documents/saliva\\_test\\_steps.pdf](http://www.gcindidental.com/images/documents/saliva_test_steps.pdf) Oral pH paper is available from a pharmacy or try the following that I found on the Internet.

<http://www.naturallydirect.net/ph-paper.html> Tape

<http://www.healingdaily.com/conditions/saliva-ph-test.htm> Tape

<http://www.vaxa.com/913.cfm> Strips

### 2. F- TOOTHPASTE

**Fluoride toothpastes** are meant to be applied topically. World-wide the F- in toothpaste ranges from 250 to 1800 ppm. Almost all toothpastes in the U.S. are 1100 ppm. Fluoride toothpastes aid in the remineralization of enamel or dentin and add fluoride to immature tooth enamel in the form of fluorapatite. Fluoride can also reduce the acid production by bacteria. The most recent research indicates that remineralization is the most important of the three modes of action.

Remineralization can only take place after demineralization. Therefore, F- must be present at the time the pH is lowered, e.g. during and after intake of fermentable material. Remineralization is most effective when the fluoride concentration is very low, e.g. 1 ppm as in drinking water. High levels of F- produce an intermediate calcium fluoride compound which is not stable and dissociates into calcium and fluoride in acid conditions. The fluoride is absorbed by the plaque, and to a lesser extent, the enamel, for use when and if the enamel is remineralizing. Higher concentrations are slightly more effective by extending the time of gradual F- release between brushings. Higher concentrations also are more likely to produce fluorosis if misused. Flossing brings the F- toothpaste to the sites of highest risk. The toothpaste also helps the floss pass through the proximal contact.

**Brushing and flossing** before eating has greater rationale for caries control than after eating and could be suggested to the highly motivated high-risk patient. However, people who floss usually do it to remove food particles and to prevent mouth odor. Brushing is the primary way to get fluoride into the mouth and can be effective in preventing gingivitis. Many people use toothpicks to remove food particles immediately after eating. For caries control, reduction in the amount of acidogenic bacteria and increasing the F- content of the plaque before eating is biologically sound, since we want to reduce the bacteria available for acid production and we want F- to be present when acid is produced. However, this practice is unlikely to find widespread use. Oral hygiene before eating could be connected with other hygiene measures such as hand washing. Although widely known, the recommendation to brush after meals is not followed because it is seen as impractical. In summary, brushing and flossing before eating might have some benefit but is not likely to be used and requiring these practices after eating is not likely to be performed and will have less effect. Thorough oral hygiene once a day is the best we can hope to accomplish.

### 3. SEALANT

All pits and fissures should be sealed within 3 months after eruption. It is impossible to know with assurance which teeth are safe from caries. However, we know that if a patient were to develop caries, the first site is likely to be in pits and fissures. The Bis-GMA (e.g. Helioseal, Delton etc.) type of resin sealant material has the best history for longevity and has been shown to be of equal effectiveness with glass ionomer cement sealants. However, application requires a fully erupted tooth in a very dry field. It can take as long as a year or more for all four first or second molars to erupt and, even then the buccal pit of the lower first molar, or the lingual groove of the maxillary molars, may not be exposed enough to permit adequate sealing with a Bis-GMA material. A second problem is the incomplete mineralization of the enamel of the newly erupted immature tooth. The question is still open as to what will happen ten years after a sealant application if the sealant is worn away and the "original", partially mineralized, fissure enamel is exposed. Will the tooth have the high risk level of a newly erupted tooth? It is already known that there is an increased risk of caries if a Bis-GMA sealant isn't completely sealed (leaks) due to insufficient etching or rinsing.

To avoid these problems or potential problems, it is recommended that all patients receive a glass ionomer cement sealant, e.g. Ketac-Fil/Molar, Fuji-Fil, at their examination appointment for all unsealed molars including those that are partially erupted. The exception would be fully erupted permanent molars in TYPE I patients which can have either GIC or Bis-GMA applied at a regular appointment. Glass ionomer cement (GIC) can be successfully placed where complete isolation is not feasible. The fluoride it contains can aid development of fluor-apatite in the pits and fissures, as well as adjoining tooth surfaces. The fluoride concentration is low and constantly available which is ideal for mineralization/remineralization. In a 3 year old patient with no other source of fluoride and all eight primary molars sealed with GIC, the urine fluoride level two weeks later was 0.50 ppm, meaning the fluoride level was within normal limits and wouldn't cause fluorosis. In an adult patient, with no other source of fluoride and over 20 teeth with large GIC temporary restorations, the urine fluoride level was 1.0 ppm. This treatment provides a highly desirable topical fluoride level always available at a safe systemic level of fluoride, if monitored properly.

GIC is so easy to apply in a short time period that it can be accomplished by either the dentist or dental therapist without rescheduling the patient. For erupting third molars, GIC sealant/F- reservoir should be placed regardless of the previous caries activity or risk. GIC can be used in less than ideal situations because, unlike Bis-GMA, the initial setting reaction is hydrophylic and, therefore, less sensitive to moist oral conditions. The bonding mechanism is electrochemical and is a one-step procedure, i.e. etching is contraindicated. Reduced isolation requirements make it possible to work in multiple quadrants. Clinical use is further eased by using the finger for application and adaptation. When the tooth reaches the occlusal plane, the GIC sealant might need adjustment to allow proper occlusion, or it might be partially or completely lost due to the occlusal forces.

GIC does not withstand occlusal forces as well as Bis-GMA. It does not "wear down" like Bis-GMA, is more likely to "fracture" under stress conditions and is less likely to be maintained in a thin layer. Occlusal adjustment might make the GIC sealant too thin to withstand occlusal forces. Only a small amount is required to have a cariogenic effect. When all the molars have erupted and are in stable position, the status of the GIC sealants should be reassessed and, if necessary, replaced with Bis-GMA sealant. Bis-GMA sealants that release fluoride have been developed for orthodontic and general use e.g., Helioseal F. However, when compared with GIC, the amount of fluoride release is generally less and doesn't last as long. On the other hand, the visible retention of GIC is very low when compared to Bis-GMA. The bottom line, caries protection has been equal.

If the patient has never had caries and is over age 25, then the need for sealants is debatable except for mothers of newborns in order to reduce sites for *S. mutans*. The risk of developing pit and fissure caries in a

tooth that has been caries-free for 10 or more years is very low. However, if their lifestyle were to change, e.g. diet, or there was an increased level of inoculation (intimate contact with someone highly infected with SM), then caries could develop where it had previously been absent. A few cases like this have been documented in adults. Sealing teeth not only drastically reduces the risk of caries in the sealed tooth, but also reduces the risk of caries in unsealed teeth by preventing bacterial transfer.

There are pros and cons on using a transparent or an opaque Bis-GMA sealant. If it is transparent it can allow the clinician to see if there is any caries developing underneath or if it is leaking. But, it may also encourage dentists who are not convinced of the value of sealants to remove them and replace them with amalgams.

#### 4. DIET CONTROL

These are simple dietary rules that will reduce caries risk and promote a healthy nutrition:

- a) **EAT ONLY AT THE EATING PLACE** - When hungry, prepare good food and sit down at the table to eat, e.g. kitchen or dining areas. Eat enough to prevent hunger for at least three hours.
- b) **BALANCED MEALS** - Foods that take a long time to digest delay the mechanism for triggering hunger. Raw and unrefined foods, proteins and fat take longer to digest. Snack foods usually contain refined carbohydrates which are easily metabolized by oral bacteria and do not satisfy hunger for very long. A combination of foods is more likely to keep the refined carbohydrates away from the dental plaque. A balanced meal delays hunger and also removes hunger as a reason for snacking.
- c) **MAXIMUM OF FIVE MEALS WITH NO SNACKS** - Saliva cannot neutralize or remove the bacterial acids sufficiently if acid is produced more than five times a day.
- d) **THREE HOURS BETWEEN MEALS** - It takes three hours for saliva to remove the acid made by the bacteria and then replace the lost tooth minerals. Eating too soon means some of the lost mineral will not be replaced.
- e) **TELEVISION AND EATING DO NOT MIX** - Eating while watching TV lengthens the bacteria's feeding time and the time for bacteria to make acid. It also shortens the time between feedings.
- f) **FLOSS WITH FLUORIDE EVERY DAY** - Flossing fluoride toothpaste between posterior contacts aids remineralization.

#### 5. SUGARLESS GUM

Chewing sugarless gum is a newly recommended habit to follow eating, especially for children. It is sweet, leaves a fresh taste in the mouth, reduces the level of acid, is already an accepted activity for most patients and is considered a treat. It can be placed at the table for easy access, like toothpicks, and does not require any extra effort. Gum chewing should not be recommended for patients who might aggravate their TMJ. Chewing gum containing only sorbitol as a sweetener should be avoided if alternatives are available. So check the label. Xylitol gums are preferred because they are actually anticariogenic and in some studies a 70% reduction in cavities (dmf). Research also suggests that xylitol attracts and then "starves" cariogenic bacteria allowing remineralization with less interruption.

Having stated the positive caries control aspects of chewing gum it must be said that it is unattractive and interferes with speech. Consul the patient about when chewing gum is a health aid such as just after eating and as a substitute for compulsive eating or to aid in smoking cessation vs. social situations (conversation).

#### 6. FLUORIDE RESERVOIR

A fluoride reservoir is any fluoride-releasing material placed at a specific caries risk site to increase the remineralization potential. Low levels of fluoride ( $\leq 1$  ppm) are the most effective aids to remineralization.

They are only effective when demineralization is taking place. The presence of fluoride in dentifrice, gum, food and water is an excellent way to provide topical fluoride, but it may not be present when demineralization is taking place. A sealant, restoration or other site-specific addition of a material that slowly releases fluoride is ideal for remineralization. Glass ionomers have been shown to have this quality and new hybrid sealants are available for this purpose. There is also fluoride varnish.

## 7. ANTI-BACTERIAL AGENTS

### CHLORHEXIDINE:

For persons with two (2) or more risk factors and a recent history of active caries there are likely to be undetected sites of active demineralization. These should be treated by remineralization and reduction in the quantity of pathogenic bacteria. This can be accomplished with F- and CHX separately as well as in combination over a limited period of time. F-products usually contain one or more elements (phosphate, sodium lauryl sulfate or low pH) that in some in vitro tests have appeared to reduce CHX effectiveness. However, in vivo and in vitro tests performed by the author have only shown differences that are not clinically significant. For application, a rinse is the first choice because it is more likely to reach the high risk site below the approximal contacts, does not require a tray and has higher patient acceptance. One month of multiple daily applications including use with floss, will greatly reduce the bacterial counts and permit remineralization to proceed. Any stain can be removed at the one month monitoring visit when the maintenance regimen is instituted. Flossing posterior contacts with CHX/Neutral NaF saturated floss is used to maintain the low bacterial count in the high risk area combined with a mechanical removal of plaque. The bacteria that are likely to remain after flossing are the most pathogenic ones and are in the gingival sulcus, or firmly attached to the enamel pellicle. Antibacterial agents applied with floss are used to control these remaining bacteria. A study has shown that, if these bacteria are not controlled and the patient continues to have a high sucrose diet, caries will continue and possibly accelerate. Since diet control is difficult to maintain for long periods, it is important to have an effective supporting method, in this case, bacterial control.

For TYPE III patients a 3 month course of CHX is recommended. It is desirable to have the patient under the CHX coverage while operative treatment is completed (both temporary treatment restorations and definitive restorations). This will permit the necessary radical change in their oral biofilm (from pathogenic to normal) and allow time for the patient to make a radical change in their oral habits vis a vis diet and oral hygiene. If they can demonstrate to themselves and to you that they can go three months in a healthy state (low risk levels including plaque reduction) then there is reason to think that a long term change is possible. The diet and flossing habits will be the most difficult to establish in TYPE III patients and it might take as long as a year or more. Flossing is essential for successful control.

In the United States, CHX comes as a rinse (Peridex®) and varnish (Cervitec + ®). The concentrations of the rinse and gel are approximately equal when considering the amount of active ingredient in a single dose. The gel has about five times the active ingredient in equivalent amount by weight. The bottle of mouthwash contains six times the amount by weight (300 gms) as the tube of gel (50 gm). In practical terms, one 2 cm strip of gel has the same amount of CHX as 10 ml of mouthwash. CHX varnish has been perfected and tested with extremely positive results. It has been shown to suppress *S. mutans* for 3-12 months. This would reduce dosage and frequency of application, increase the effectiveness and avoid the staining.

### PROVIDONE-IODINE

Povidone-Iodine is an antiseptic to the teeth and mucosa especially in children at high risk for caries. It can be applied and they followed with fluoride varnish. Contraindications are iodine sensitivity, a history of thyroid disease, and pregnancy.

### SILVER NITRATE (SN) and SILVER DIAMINE FLUORIDE (SDF)

The silver in these compounds is the bacteriocidal element. They are applied as liquids over active caries and then covered with fluoride varnish or glass ionomer cement (GIC).

## 8. INTERIM THERAPEUTIC RESTORATIONS (ITR) FOR CARIES CONTROL (Pre-Emergency)

Open cavitations or Grade 4 lesions (more than ½ way through the dentin) should be considered for a glass ionomer ITR. Soft debris should be completely removed. The pulp has been under attack by bacterial acids and toxins and should be spared the additional insult of traumatic operative cutting procedures, even hand instrumentation. If the lesion is large enough, calcium preparations, e.g. DYCAL, can be placed over the area nearest the pulp to neutralize the acid. This is followed by glass ionomer cement to provide fluoride, to avoid thermal conduction and to seal the cavity from bacteria. More teeth can be treated at a single appointment than with the standard temporary treatment methods because no anesthetic is used, there is minimal or no caries removal, no cavity preparation. Placement of GIC is simple and fast. This approach is biologically sound and provides the patient with maximum caries control.

Do not return the tooth anatomy to the "correct" form and function. The purpose is to protect the pulp from further insult so that it can repair itself. Keep the marginal ridge out of occlusion to reduce the chance of fracturing the glass ionomer cement. Do not use a matrix band because the placement may be painful; may initiate bleeding; takes time; the matrix removal could fracture the GIC; and it will prevent additional retention via GIC bonding with the adjacent tooth. Contact of GIC with the interproximal gingiva does not produce inflammation.

## 9. DEFINITIVE RESTORATIONS

Once caries control treatment has been completed, it is desirable to wait for 1 - 3 months before placing definitive restorations. This allows the pulp to recover from the chronic caries attack. It also reduces the chance of placing a definitive restoration in a tooth that has an irreversible pulpitis. After the risk factors are reduced and the pulp has had a rest, then replace the temporary restoration with a definitive one. At this point there will be some hope that the word "permanent" will have some meaning. Permanent will still be a misnomer unless the causes of the caries have been removed to the point of avoiding recurrent caries.

## 10. ANTACID - CALCIUM CARBONATE (CaCO<sub>3</sub>)

An antacid can counteract chronic oral acidity that has been resistant to the previous methods. Almost any antacid will reduce the acidity temporarily, but many of the common brands contain sugar as a sweetener. Most of the antacids contain magnesium which, if ingested in large amounts, will have a negative effect on systemic calcium retention. They also contain aluminum which, for a while, was linked with Alzheimer's disease. For that reason, it is best to prescribe a CaCO<sub>3</sub> suspension that is prepared by a pharmacist. The suspension is usually made with glycerin. The patient can rinse with it whenever the saliva pH is < 6.0. They can check the acidity with Oral pH paper that is available from a pharmacy or try the following that I found on the Internet.

<http://www.naturallydirect.net/ph-paper.html> Tape  
<http://www.healingdaily.com/conditions/saliva-ph-test.htm> Tape  
<http://www.vaxa.com/913.cfm> Strips

One drawback of this agent is the dry feeling it produces in a mouth that is already dry. On the other hand, the dry mouth retains the CaCO<sub>3</sub> for a long time. This single method has maintained an adult patient with Sjogrens syndrome in a caries-free state for 8 years after having received 56 restorations in the previous 5 years of treatment (12 of them replaced once or twice during that period).

Renew 2 x    Rx:    Calcium Carbonate 50% Susp. In glycerin with pink color. 300 ml.  
                  Disp: 1 bottle  
                  Sig:    Rinse p.c., h.s., and p.r.n. oral pH <6.

Ivoclar Vivadent® has a hybrid restorative material (compomer) that releases fluoride. If this quality proves to be clinically effective on a long term basis, then it would be the restorative material of choice for high risk caries patients along with glass ionomer cement.

## 11. SYNTHETIC SALIVA

Synthetic saliva is designed for a patient with a dry mouth. It permits food to be chewed and keeps lips from sticking together. It usually contains one ppm of fluoride to help remineralization. It is especially useful as a coating following a CaCO<sub>3</sub> rinse.

Rx: Xerolube (or other brands)

Disp: 2 bottles

Sig: Following CaCO<sub>3</sub> rinse to reduce dry feeling.

## 12. SUGAR SUBSTITUTE

There are many sugar substitutes on the market with a variety of trade names. They work by keeping the patient from using sugar, by stimulating saliva and, in the case of xylitol, by reducing the acid produced by acidogenic bacteria. Xylitol is the most effective because it is anticariogenic. It is also the most expensive because it is a natural product that is harvested from trees. Xylitol has been successfully incorporated into chewing gum and shown to reduce caries rates and activity in children. Xylitol is the sole sweetener in XYLIFRESH, made in the U.S.A. Xylitol is combined with sorbitol, another sugar substitute, in TRIDENT chewing gum manufactured in Europe while TRIDENT made in the U.S.A. has only sorbitol. Aspartame is a protein that is marketed as NUTRASWEET or CANDERYL or EQUAL and is used in soft drinks and in crystalline form as a substitute for table sugar and in chewing gum. Aspartame loses its sweetness at higher temperatures and cannot be used in most products that are cooked (baked goods) or hot drinks (coffee). All sugar substitutes have some drawbacks so you should be knowledgeable about the product before recommending it. Fructose is also available in the markets for use as a sucrose substitute. There is a slight advantage to using fructose vs. sucrose, since it provides *S. mutans* with less of the energy it needs to "stick" to the smooth surfaces. Also, per serving, fructose is sweeter than sucrose. However, fructose is not a sugar substitute and produces the same amount of calories and bacterial acid per gram.

## 13. WATER

Increasing the amount of water intake will increase the amount of saliva, as well as urine. Fluoridated water is best. The caffeine in soft drinks and coffee and similar agents in tea are diuretics and dry the mouth. Sugar pulls water into the intestinal tract which increases thirst. This is why soft drinks don't quench thirst.