

# CJDH JCHD

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## Review of the Oral Disease- Systemic Disease Link.

### Part II: Preterm Low Birth Weight Babies, Respiratory Disease



THE CANADIAN DENTAL  
HYGIENISTS ASSOCIATION  
L'ASSOCIATION CANADIENNE  
DES HYGIÉNISTES DENTAIRES



## Agents of Change

by Bonnie Blank, AASc, BSc(DH), MA



LEADERSHIP FROM THE TOP CAN AFFECT change—but changes can be sustained only when individuals accept and work with the new paradigm.

In October 2006, I had the honor of making a presentation to the House of Commons pre-budget consultations in Ottawa. I spoke as an advocate for increasing access to oral health care as well as increasing spending for the underserved population. Then, in November, I presented to the House of Commons Standing Committee on Human Resources, Social Development and the Status of Persons with Disabilities about the impact of oral health on employability in Canada. In both of these presentations, I was speaking on your behalf. I was very proud to have these experiences as it highlighted the fact that we, both as individuals and as a profession, can bring about change. As dental hygienists, we want to increase access to dental hygiene services. Whether in the area of oral health promotion or prevention, we need to reach a greater number of Canadians.

*I spoke as an advocate for increasing access to oral health care as well as increasing spending for the underserved population.*

What is the most effective way of bringing about the kinds of changes that will improve the oral health for all Canadians? Do we just need to work harder, smarter, and more effectively? Or do we need to make changes at a deeper, more systemic level? How does change come about and how can each of us make a difference?

Life *is* change, as the Greek philosopher Heraclitus observed over 2,500 years ago. Each moment is different from every other. Nothing remains static for an instant, whether looked at from a molecular or planetary level. Whether we welcome it or not, change is unavoidable—everyday we adjust and adapt to the changing world around us. However, we feel frustration when we try to implement change to no avail. I can't help but think of the effort that we as dental hygienists are putting into changing the oral habits of our clients. I always find it interesting how clients confess openly that they have not been flossing their teeth since their last visit and then heave a

Agents of Change ...continued on page 22

## Agents de changement

par Bonnie Blank, A.A.Sc., B.Sc.(DH), M.A.

LE LEADERSHIP DES ÉCHELONS SUPÉRIEURS peut avoir une incidence sur le changement – mais la continuité du changement ne peut être assurée que lorsque les individus acceptent et utilisent le nouveau paradigme.

En octobre 2006, j'ai eu l'honneur de faire une présentation à la Chambre des communes dans le cadre des consultations prébudgétaires tenues à Ottawa. J'ai agi comme porte-parole et parlé en faveur d'un accès accru aux soins de santé buccodentaire ainsi que d'une augmentation des dépenses pour la population mal servie. Puis, en novembre, j'ai fait une présentation au Comité permanent de la Chambre des communes sur les ressources humaines, le développement social et la condition des personnes handicapées concernant les répercussions de la santé buccodentaire sur l'employabilité au Canada. Lors de ces deux présentations, j'ai parlé en votre nom. J'étais très fière de vivre ces expériences puisqu'elles permettaient de faire ressortir le fait que nous, en tant qu'individus et en tant que profession, pouvions provoquer des changements. Comme hygiénistes dentaires, nous voulons accroître l'accès aux services d'hygiène dentaire. Que ce soit dans le domaine de la promotion de la santé buccodentaire ou dans celui de la prévention, nous devons pouvoir atteindre un plus grand nombre de Canadiens et de Canadiennes.

*J'ai agi comme porte-parole et parlé en faveur d'un accès accru aux soins de santé buccodentaire ainsi que d'une augmentation des dépenses pour la population mal servie.*

Quelle est la façon la plus efficace de provoquer le genre de changements qui amélioreront la santé buccodentaire de tous les Canadiens et les Canadiennes? Avons-nous simplement besoin de travailler plus fort, plus intelligemment et plus efficacement? Ou, avons-nous besoin des faire des changements plus systémiques et plus profonds? Comment les changements surviennent-ils et comment chacun et chacune de nous peut-il ou peut-elle faire une différence?

La vie est changement, comme l'a fait remarqué le philosophe grec Héraclite il y a plus de 2 500 ans. Chaque

Agents de changement ...suite page 38



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# CONTENTS



## EVIDENCE FOR PRACTICE

**Review of the Oral Disease-Systemic Disease Link.**  
**Part II: Preterm Low Birth Weight Babies, Respiratory Disease**  
**CDHA Position Statements**  
*by CDHA* ..... 8

**CDHA Position Paper**  
*by Judy Lux, BA, MSW* ..... 8

**Pacifier- and Digit-Sucking Habits [excerpt]**  
*by Erik Larsson and Samir Bishara* ..... 23

**Evaluation of Toothpastes and of the Variables Associated with the Choice of a Product**  
*by the Comité dentifrice of the Collège François-Xavier-Garneau* 42

## OBSERVATIONS

**Reflections on Conducting Structured Interviews with a Senior Population and Participating on a Research Team**  
*by Nancy R. Neish, DipDH, BA, MEd* ..... 30

## DEPARTMENTS

**President's Message de la présidente**  
*Agents of Change / Agents de changement* ..... 3

**Executive Director's Message de la directrice générale**  
*Labour Surveys and CDHA Membership / Sondages sur le travail et adhésion à l'ACHD* ..... 7

**News** ..... 39

**The Library Column: Journals in Our Library...continued** ..... 57

**Probing the Net: More on Oral-Systemic Disease Links and Thumbsucking** ..... 59

**Classified Advertising** ..... 62

**Advertisers' Index** ..... 62



## Labour Surveys and CDHA Membership

by Susan Ziebarth, BSc, MHA, CHE



## Sondages sur le travail et adhésion à l'ACHD

par Susan Ziebarth, B.Sc., M.H.A., C.H.E.

*"Looking at yourself in a mirror isn't exactly a study of life"*  
– Lauren Bacall, 1990

AS WE ENTER INTO THE NEW YEAR, WE OFTEN LOOK back at what went right in the year just past and what could have gone better. We may make some resolutions, promises, or suggestions to ourselves on what we would like to change this year. In an organization, a survey is also added to this pondering. Although surveys serve many functions, one of their benefits is that they are an excellent tool to influence change. They are both a "mirror and a maker of organizational change,"\* reflecting what exists at present and suggesting what might be.

*Surveys... are both a "mirror and a maker of organizational change..."*

Surveys are important to organizations because the quality of decisions improves if there are many perspectives on a topic. To paraphrase Lauren Bacall, organizations can't really understand their stakeholders if they only look at themselves. CDHA does request your input on a variety of subjects quite frequently. We are now in the process of collating the conference survey that many of you took the time to complete. And members in many provinces are receiving a labour survey with this issue of the journal while members in other provinces will receive the same survey from a different source, such as your regulatory body. CDHA and many provincial partners are asking for this information so we can have quality results to share with you so that you can influence change. This information will be available to you to help you negotiate fair and equitable wages and benefits.

When a large number of people respond to a survey, the quality of the results improves. Our labour survey asked the same questions of dental hygienists from coast to

**Labour Surveys and CDHA Membership**  
...continued on page 61

\* Hartley J. Employee surveys: strategic aid or hand-grenade for organisational and cultural change? Int J Public Sector Mgmt. 2001;14(3):184.

*« Se regarder dans un miroir n'est pas exactement une étude de vie »* [Traduction]

– Lauren Bacall, 1990

LORSQUE NOUS ENTAMONS LA NOUVELLE ANNÉE, NOUS regardons souvent en arrière pour voir ce qui a bien été dans l'année qui vient juste de passer et ce qui aurait pu aller mieux. Nous pouvons prendre certaines résolutions, nous faire à nous-mêmes certaines promesses ou suggestions sur ce que nous aimerions changer cette année. Dans une organisation, un sondage s'ajoute également à cette réflexion. Bien que les sondages servent à plusieurs fins, un de leurs avantages est qu'ils sont un excellent outil pour influencer sur le changement. Ils sont à la fois un « miroir et un agent de changement organisationnel »\*, reflétant ce qui existe actuellement et suggérant ce qui peut être.

*Sondages... sont à la fois un « miroir et un agent de changement organisationnel »*

Les sondages sont importants pour les organisations parce que la qualité des décisions s'améliore lorsqu'il y a plusieurs points de vue sur un sujet. Pour paraphraser Lauren Bacall, les organisations ne peuvent réellement comprendre leurs membres participants si elles ne font que se regarder elles-mêmes. L'ACHD demande très fréquemment vos commentaires sur une variété de sujets. Nous sommes actuellement en train d'assembler les données du sondage sur la conférence que plusieurs d'entre vous ont pris le temps de remplir. Et, les membres de plusieurs provinces ont reçu un sondage sur le travail avec l'édition du journal alors que des membres d'autres provinces recevront le même sondage provenant d'une source différente, comme votre organisme de réglementation. L'ACHD et plusieurs partenaires provinciaux demandent cette information afin que nous puissions avec des résul-

**Sondages sur le travail et adhésion à l'ACHD**  
...suite page 22

\* J. Hartley, Employee surveys: strategic aid or hand-grenade for organisational and cultural change? Int J Public Sector Mgmt. 2001;14(3):184.

# Review of the Oral Disease-Systemic Disease Link. Part II: Preterm Low Birth Weight Babies, Respiratory Disease

## Canadian Dental Hygienists Association Position Statements

### Preterm low birth weight babies

In light of the possible association between periodontal disease and preterm low birth weight (PT/LBW) babies, women who are considering pregnancy or who are pregnant should have access to oral health services (including oral health promotion, disease prevention, and treatment), regardless of their income. In addition, dental hygienists should consider incorporating the following strategies into their practices:

- Educate pregnant women and those planning pregnancy regarding the possible impact of periodontal infection on pregnancy outcomes and benefits of treatment.
- Consider periodontal examinations and as-needed periodontal therapy as a necessary part of prenatal care for all women who are pregnant or planning pregnancy.
- Provide preventive oral care as early in pregnancy as possible, and throughout the pregnancy.
- Consider consultation with the clients' health care professionals to advise them of the diagnosis and treatment considerations.
- Increase interprofessional collaboration and communication between dental hygienists and public health prenatal programs in order to formalize support for pregnant women. These new opportunities can focus on oral/general health assessments, leadership capacity, policy development, surveillance, program delivery and evaluation.

### Respiratory disease

In light of the clear association between periodontal disease and pneumonia in health-compromised seniors in intensive and long-term care, high-risk seniors should have access to oral health services (including oral health promotion, disease prevention- and treatment), regardless of their income. In addition, dental hygienists should consider incorporating the following dental hygiene diagnosis and treatment issues into their practices:

- Provide disease prevention and treatment services for individuals at high risk for pneumonia, who are in intensive care units and long-term care facilities.
- Provide in-service training on oral health education to intensive care unit and long-term care facility staff.
- Increase interprofessional collaboration and communication between dental hygienists and long-term care facilities, and critical care units of hospitals. These new opportunities can focus on oral/general health assessments, leadership capacity, policy development, surveillance, program delivery and evaluation.

**Keywords:** Infant, low birth weight; Meta-analysis; Oral hygiene; Periodontal diseases; Respiratory tract diseases; Review literature

## CDHA Position Paper

by Judy Lux, BA, MSW

### INTRODUCTION

IN 2004, CDHA PUBLISHED A PAPER TITLED "YOUR Mouth – Portal to Your Body. CDHA Position Paper on the Links between Oral Health and General Health."<sup>1</sup> The evidence from this paper, although preliminary, supports the conclusion that oral diseases may have an association with the occurrence and severity of the following conditions: diabetes mellitus, heart disease, preterm low birth weight babies, and lung disease. In addition, oral hygiene

treatment was found to improve diabetic control of type 2 diabetes and to reduce the risk of premature birth and low birth weight. Following the publication of the 2004 position paper, substantial new research on this topic has been published. This current position paper updates the 2004 paper with a growing body of research that supports a link between oral diseases and systemic diseases. This new position paper is divided into two sections; the first section covered heart disease and diabetes and was published in the November-December 2006 issue of this journal. The second section, in this issue of the journal, covers preterm low birth weight babies and respiratory disease.

Other oral health organizations have issued position papers on this topic that lend support to CDHA's position.

# Déclarations de l'Association canadienne des hygiénistes dentaires

## Bébés prématurés de poids insuffisant à la naissance

Compte tenu de l'association possible entre la maladie parodontale et les bébés prématurés de poids insuffisant à la naissance, les femmes qui songent à une grossesse ou celles qui sont enceintes devraient avoir accès à des services de santé buccodentaire (incluant la promotion de la santé buccodentaire, la prévention de la maladie et le traitement) peu importe leurs revenus. De plus, les hygiénistes dentaires devraient considérer l'intégration des stratégies suivantes dans leur pratique :

- Éduquer les femmes enceintes et celles qui planifient une grossesse concernant les répercussions possibles d'une infection parodontale sur les résultats de la grossesse et sur les avantages du traitement.
- Considérer les examens parodontaux et, au besoin, le traitement parodontal comme un élément nécessaire des soins prénatals pour toutes les femmes qui sont enceintes ou qui planifient une grossesse.
- Prodiguer des soins buccodentaires préventifs aussitôt que possible dans la grossesse et tout au long de celle-ci.
- Considérer une consultation avec les professionnels en soins de santé des clientes afin de les informer du diagnostic et des traitements envisagés.
- Augmenter la collaboration et la communication interprofessionnelles entre les hygiénistes dentaires et les programmes prénatals des services de santé publique afin d'officialiser le soutien apporté aux femmes enceintes. Ces nouvelles possibilités d'action peuvent englober les évaluations de l'état de santé générale et de l'état de santé buccodentaire, la capacité de leadership, le développement de politiques, la surveillance, la mise en œuvre de programmes et l'évaluation.

## Maladies respiratoires

Compte tenu de l'association évidente entre la maladie parodontale et la pneumonie chez les personnes âgées fragilisées admises dans les unités de soins intensifs et de soins de longue durée, les personnes âgées à haut risque devraient avoir accès à des services de santé buccodentaire (incluant la promotion de la santé buccodentaire, la prévention de la maladie et le traitement) peu importe leurs revenus. De plus, les hygiénistes dentaires devraient considérer l'intégration des stratégies suivantes de diagnostic et de traitement en hygiène dentaire dans leur pratique :

- Offrir des services de prévention et de traitement de la maladie aux personnes à haut risque pour la pneumonie qui se trouvent les unités de soins intensifs et dans les établissements de soins de longue durée.
- Offrir de la formation interne portant sur l'éducation en santé buccodentaire au personnel des unités de soins intensifs et des établissements de soins de longue durée.
- Augmenter la collaboration et la communication interprofessionnelles entre les hygiénistes dentaires et les établissements de soins de longue durée et les unités de soins intensifs des hôpitaux. Ces nouvelles possibilités d'action peuvent englober les évaluations de l'état de santé générale et l'état de santé buccodentaire, la capacité de leadership, le développement de politiques, la surveillance, la mise en œuvre de programmes et l'évaluation.

These specific positions are identified in more detail in the separate sections of this paper.

The year following CDHA's first position paper on this topic, the Canadian Dental Association (CDA) issued a statement that takes a reserved, somewhat cautious approach to the topic. Although the CDA notes that the U.S. Surgeon General highlights a bi-directional interaction between oral and systemic health, CDA recommends that "further emphasis should be placed on research and educating dentists, physicians, students, residents, other healthcare professionals and most importantly patients regarding the importance of these possible relationships."<sup>2</sup>

Periodontal disease is considered the most prevalent chronic disease affecting children, adolescents, adults, and the elderly.<sup>3</sup> In addition, periodontal disease is an infectious disease that may be transmitted from one person to another. In the United States, there are recent national statistics indicating the prevalence of periodontal disease is

between 3.8% and 12.3% of the population.<sup>4</sup> Similar recent Canada-wide information is not available; however, 35 years ago, 15% of Canadians aged 19 years and over had periodontal pockets.<sup>5</sup>

A more recent but partial picture of Canadian data comes from several provincial studies. In 1986, a Saskatchewan study indicated that of those aged 30 to 44 years, 34% had 4 or 5 mm periodontal pockets and 15% had periodontal pockets ( $\geq$ ) 6 mm.<sup>6</sup> In addition, a 2001 Quebec study indicates that people with low family income, men, and persons living in metropolitan areas are at higher risk of having at least one tooth with a pocket ( $\geq$ ) 6 mm.<sup>7</sup> New developments indicate that Canada is beginning to address some of the oral health data gaps. Dr. Peter Cooney, Canada's Chief Dental Officer, has developed an oral health component of the Canadian Health Measures Survey. The statistics gathered will not only provide us with national prevalence rates but will also assist in

determining the extent of the relationship between oral health and systemic health.

## METHODOLOGY

The methodological approach in this paper is a comprehensive review of systematic reviews, meta-analysis, literature reviews, and clinical trials on the connection between periodontal diseases and systemic diseases, specifically preterm/low birth weight babies, and respiratory disease. The research question was: What is the relationship between periodontal disease and preterm low birth weight babies and respiratory disease? This question was used to develop the following search terms: periodontal disease, periodontal diseases, periodontitis, preterm birth, preterm births, low birth weight, low birth weights, pregnancy and pregnancy outcomes, respiratory disease, respiratory diseases, and chronic obstructive pulmonary disease, pneumonia, lung disease, and respiratory tract infections.

### *The research question was: What is the relationship between periodontal disease and preterm low birth weight babies and respiratory disease?*

The literature was limited to English language human studies in MedLine, Cochrane controlled trials register, and Google Scholar from 2003 to March 2006. The database search retrieved four articles pertaining to PT/LBW and four articles pertaining to respiratory disease; all of these articles were included in this review as they met quality standards. The search also included reference lists of published review papers to identify additional articles. The search also included “gray” literature—information not reported in the scientific periodical literature—and web sites known to contain publications on this topic. Consultation with two recognized topic experts, Salme Lavigne and Dr. Howard Tenenbaum, took place at a number of developmental stages and a consultation on the draft paper took place with CDHA members and other topic experts.

## PRETERM LOW BIRTH WEIGHT BABIES

### Literature Review

The World Health Organization defines preterm birth as birth prior to 37 weeks of gestation and low birth weight as babies born under 2500 grams.<sup>8</sup> In Canada, the preterm birth rate has been increasing recently. In 2000, the preterm birth rate was 7.6 per 100 live births, compared with 6.6 per 100 live births in 1991.<sup>9</sup> There is regional variation in this rate, with a low of 5.8 in Prince Edward Island to a high of 10.4 in Nunavut.<sup>9</sup> There has also been a recent rise in the incidence of low birth weight, which may be explained by a decline in infant mortality rate and an increase in multiple births. Low birth weight rates in Canada in 1996 ranged from a low of 4% in the Yukon to a high of 9% in Newfoundland.<sup>10</sup>

The consequences of preterm birth (PTB) and PT/LBW babies are staggering. The infant morbidity and mortality<sup>11</sup> associated with PT/LBW create a significant economic drain on the health system, and social and emotional problems for the families involved who often manage long-term disabilities in their children. Preterm birth accounts for 75% to 85% of all perinatal mortality in Canada and is considered an important determinant of neonatal and infant morbidity, including neurodevelopmental handicaps, such as cerebral palsy; chronic respiratory problems; infections; and ophthalmological problems.<sup>12</sup>

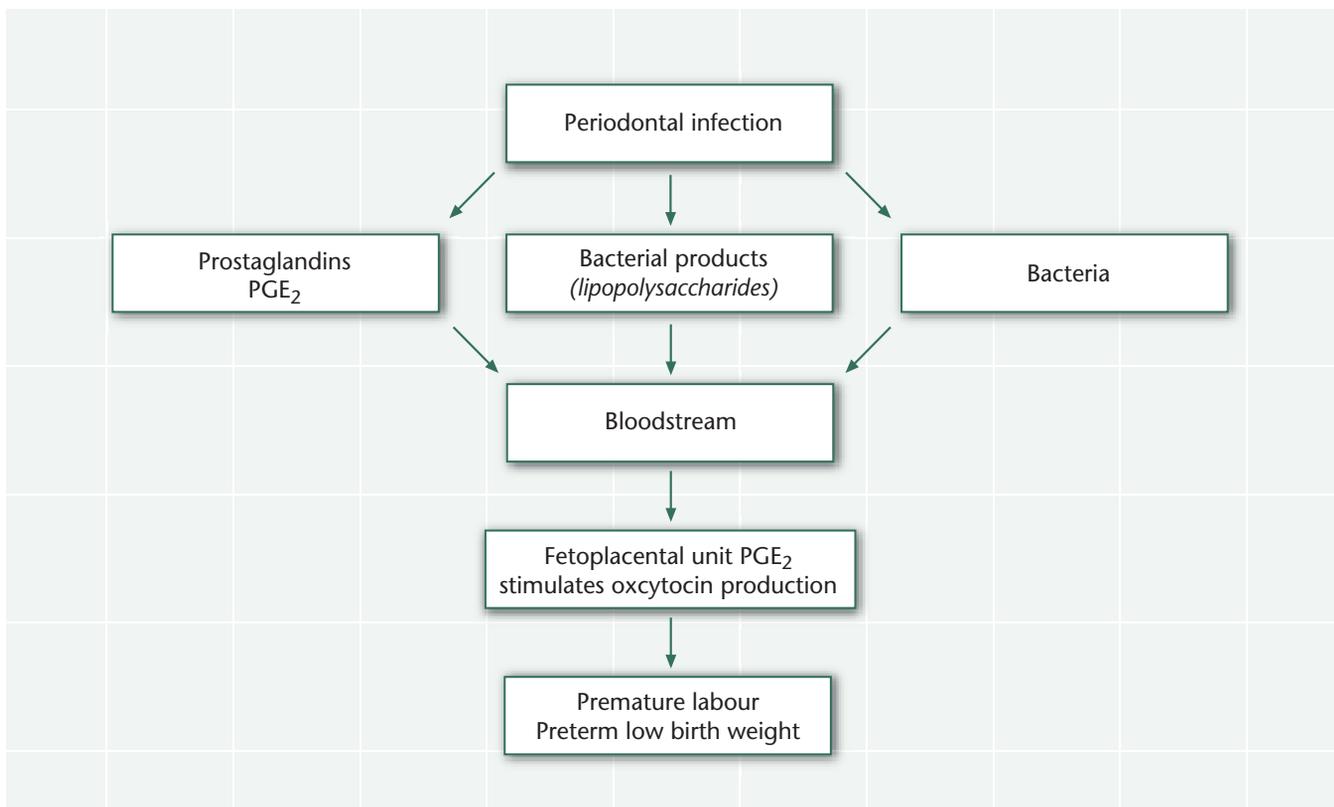
Research as early as 1931 found that periodontal diseases in the mother may have harmful effects on the developing fetus.<sup>13</sup> CDHA's 2004 position paper reports on the results from case-controlled, prospective, and intervention studies and two randomized controlled trials. It concludes that there is a possible link or correlation between periodontal disease and PLBW and preterm birth and that women with periodontal disease may have a 4 to 7.9 odds ratio (OR) of having a preterm birth than women with good oral health.<sup>1</sup> These findings are consistent with former studies that indicate chronic infection plays an important role in PT/LBW, including bacterial vaginosis (BV),<sup>14,15</sup> genitourinary infections,<sup>16,17</sup> kidney infection and pneumonia.<sup>11</sup> The CDHA position paper also indicated that there is preliminary evidence that periodontal treatment during pregnancy may reduce the incidence of adverse pregnancy outcomes.<sup>1</sup> Other research not included in the CDHA position paper and conducted following the publication of the paper also support this conclusion.<sup>18,19</sup>

The American Academy of Periodontology issued a position statement in 2004, the same year as CDHA's first statement, recommending that “women who are pregnant or planning pregnancy undergo periodontal examinations...” and that “preventive oral care services should be provided as early in pregnancy as possible. However, women should be encouraged to achieve a high level of oral hygiene prior to becoming pregnant and throughout their pregnancies.”<sup>13</sup> Other groups approved the content of this statement, including the American College of Obstetricians and Gynecologists, the U.S. March of Dimes, and the U.S. National Nursing Association.<sup>20</sup> Furthermore, consumer groups are also taking a stand on this topic to demand better services for the public. In 2001, the U.S. National Healthy Mothers, Healthy Babies Coalition published the following position statement, “...oral health care during pregnancy is crucial and should be made available to all women, regardless of their income level.”<sup>21</sup>

Another measure of the growing importance of this topic in our society is the degree of emphasis that research centres place on this topic. At present, the U.S. National Institute of Dental and Craniofacial Research (NIDCR) has made a significant investment in research on this topic, with a large \$20 million research project that includes two independent multi-centre clinical trials. This research involves approximately 2,600 pregnant women.







**Figure 1.** Proposed biological mechanisms for induction of premature birth

Although the mechanism of action is still unclear, three mechanisms (figure 1) have been proposed to explain how periodontal disease may influence preterm low birth weight babies:<sup>1</sup>

- Periodontal infection causes the release of prostaglandins into systemic circulation.
- Lipopolysaccharides from cell walls of periodontal pathogens trigger the release or production of prostaglandins.
- Translocation of the periodontal micro-organisms to the fetoplacental unit and stimulate the release of prostaglandins.

## RESULTS

In 2003, a systematic review of twelve studies concluded that periodontal disease may be a risk factor for PT/LBW and there is preliminary evidence suggesting that periodontal intervention may reduce adverse pregnancy outcomes.<sup>22</sup> The review included six case control,<sup>23-28</sup> three cross-sectional and longitudinal,<sup>29-31</sup> and three intervention studies.<sup>18,19,32</sup> Due to study heterogeneity, meta-analysis was not possible.

A 2004 review on this topic included nine studies: four case control,<sup>23,25-27</sup> two prospective,<sup>24,29</sup> one prospective cohort,<sup>32</sup> one intervention,<sup>19</sup> and one cohort.<sup>18</sup> The review concludes that periodontal disease may act as a risk factor for PLBW.<sup>33</sup>

A 2005 meta-analysis of five observational studies concludes that periodontal diseases in the pregnant mother significantly increase the risk of preterm birth or low birth

weight.<sup>12</sup> This meta-analysis included two case-control studies and three prospective cohort studies.<sup>18,23,24,29</sup> These studies showed that pregnant women with periodontal disease have an adjusted odds ratio of 4.28 (95% CI, 2.62 – 6.99;  $P < 0.005$ ) for preterm birth and 5.28 (95% CI, 2.21 – 12.62;  $P < 0.005$ ) for preterm low birth weight babies. The authors identify several limitations to this meta-analysis; the most striking limitations include the poor-to-fair quality of the studies and the considerable variation in the definition of exposures and outcomes from one study to the next.

In 2006, a systematic review of 25 studies, from 14 countries, concluded that periodontal disease may be associated with an increased risk of adverse pregnancy outcome (including PT/LBW, LBW, preterm birth weight by gestational age, miscarriage or pregnancy loss, and pre-eclampsia).<sup>34</sup> The studies included 13 observational studies, case control, cross-sectional,<sup>23,26,27,35-44</sup> 9 cohort studies,<sup>9,19,28-30,45-48</sup> and 3 controlled trials (2 were RCTs).<sup>18,32,49</sup>

There were 18 studies suggesting an association between periodontal disease and increased risk of adverse pregnancy outcome (ORs ranging from 1.10 to 20.0) and 7 studies found no evidence of an association (ORs ranging from 0.78 to 2.54). Three clinical trial intervention studies, two of which were randomized controlled trials, suggest that oral prophylaxis periodontal treatment can lead to a 57% reduction in PT/LBW (pooled RR 0.43; 95% CI 0.24-0.78) and a 50% reduction in preterm births (RR 0.5; 95% CI 0.20-1.30). The authors note that it was not appropriate

to calculate the pooled risk in the case-control and cohort studies, due to heterogeneity. The authors also note some of the drawbacks to the studies, which include a large variation in the definition of periodontal disease status, small sample size in many of the studies, and a potential bias due to confounding effect of other variables, which were not controlled for in 15 of the 23 studies. (The two RCTs did not have potential bias from confounding variables.) The authors note that the effects of periodontal disease on adverse pregnancy outcomes may be different according to the socio-economic status and access to dental care, with studies of economically disadvantaged women.

In 2006, a systematic review concluded that periodontal disease is not a causal risk factor for PT/LBW.<sup>50</sup> Of the nine case-control studies, five found a relationship between periodontal disease and PT/LBW with odds ratios ranging from 3.4 to 7.9. Of the four cohort studies, two supported an association and two did not. Of the four intervention studies, two found a reduction in the incidence of PT/LBW following dental hygiene treatment, with one of these studies using a randomized controlled methodology. Two other intervention studies found no reduction in the incidence of PT/LBW. Of the two systematic reviews, both concluded that periodontal disease may be a risk factor for PT/LBW, but the evidence is limited.

### *The balance of this preliminary evidence supports an association between periodontal disease and PT/LBW.*

Another 2005 randomized controlled trial was not included in the above reviews and is therefore reported separately.<sup>51</sup> Study participants included 870 pregnant women with gingivitis. At 28 weeks, the treatment group received plaque removal, scaling every two to three weeks and daily rinsing with 0.12% chlorhexidine. After adjusting for several known risk factors, women with gingivitis in the control group had a significantly higher risk of PT/LBW than women who received periodontal treatment (OR 2.76; 95% CI 1.29-5.88; P=0.008).

#### **DISCUSSION**

There are several drawbacks to the reviews. First, although there is an internationally accepted World Health Organization definition of low birth weight (birth weight of <2500g),<sup>52</sup> some of the reviews did not report on their adherence to this definition. In addition, a number of the studies did not use consistent definitions of periodontal disease. Second, the 2003 systematic review by Scannapieco et al. identifies some of the drawbacks to comparing the studies, including the lack of a standard measure for periodontal disease, or which periodontal disease is being measured. Third, since risk factors such as race, low socio-economic status, low educational levels, tobacco, drug and alcohol abuse are common risk factors for PLBW and periodontitis,<sup>22</sup> the studies should have

more consistently mentioned controlling for these variables, or used subsets of these risk factors. Fourth, the 2005 meta-analysis of five observational studies indicates a wide range in the confidence interval for PTLBW OR, pointing to caution in the claim.

Cassolato et al.'s 2006 review<sup>50</sup> sets out to determine a causal link between periodontal disease and PT/LBW and concludes that none exists. However, only RCTs can determine this. This means that although the literature does not support a causal link, it does not mean that one does not exist. It simply means that the research available for analysis did not allow an assessment of this question. A second critique of this review is that the authors appear to treat all of the studies equally. However, Lopez's RCT may have been given extra weight in the argument, given that it was a gold standard research design.

The balance of this preliminary evidence supports an association between periodontal disease and PT/LBW. This review included a total of 51 studies, with 44 studies concluding that there may be an association between periodontal disease and preterm low birth weight babies. Only 7 studies concluded that there is no evidence of an association and these studies were not high-level evidence, as the studies were observational, case control, cross-sectional, and cohort. The strongest evidence comes from the one controlled trial (CT) and three randomized controlled trials, which are considered the gold standard. The CT shows striking evidence that dental hygiene services may be associated with a 50% risk reduction in PT/LBW and one RCT (Lopez et al. 2005) shows that dental hygiene services result in an OR of 2.76.

Meta-analysis using randomized control trials (RCTs) is the gold standard; however, the 2005 meta-analysis reports only on a meta-analysis of observational studies. Meta-analyses such as the one reported here, using observational studies, have become popular in biomedical literature and there are guidelines for reporting them.<sup>53</sup> The odds ratio estimate from the meta-analysis of observational studies reported in Khader et al.<sup>12</sup> (5.28 for PT/LBW and 4.28 for PTB) is consistent with the odds ratio from an RCT reported in the 2004 CDHA position paper. However, there are a number of limitations to Khader's meta-analysis. First, it does not follow accepted guidelines for reporting meta-analysis of observational studies. Second, there are limitations in the use of the odds ratio, since observational studies are commonly influenced by confounding and selection bias, which may distort the findings. In fact, some authors claim that statistical combination of data should not be a prominent feature of reviews of observational studies.<sup>54</sup> Third, the author combines results from different study designs without a discussion of the heterogeneity of the studies and the limitations of this approach. The results may indicate a possible association; however, the authors' conclusions that "periodontal disease significantly increases the risk of PLBW" may have somewhat limited applicability given the limitations of the study. These concerns point to caution in the claim for a causal relationship between periodontal disease and PT/LBW babies.





To determine a causal relationship will require a meta-analysis of high-quality randomized controlled trials. Therefore, additional longitudinal, randomized controlled clinical trials are needed that evaluate the efficacy and cost-effectiveness of different types of periodontal intervention on adverse pregnancy outcomes.

In light of the possible association between periodontal disease and PT/LBW, there should be increased interprofessional collaboration and communication between dental hygienists and prenatal programs in order to formalize support for pregnant women. These new opportunities can focus on oral/general health assessments, leadership capacity, policy development, surveillance, program delivery and evaluation. Due to the high social and economic costs associated with PT/LBW, the role of preventing oral infection in pregnant women may be an important one when planning the public health of Canadians. Dental hygienists should become more involved in educating clients about this association and providing early oral hygiene services for pregnant women and those considering pregnancy. This can be accomplished through a greater role for dental hygienists in public health programs targeting pregnant women, such as the Public Health Agency of Canada's Prenatal Nutrition Program. Dental hygienists could play an important role in achieving the program goal of reducing unhealthy birth weights.

## RESPIRATORY DISEASE

### Literature Review

The 2004 CDHA position paper concludes that there is a moderate association between periodontal disease and respiratory disease, with an odds ratio of approximately 3.04 for those at risk of developing respiratory disease.<sup>1</sup> The following statistics on respiratory disease incidence, impact on health, and health system expenses provide a rationale for the need to continue this research.

Respiratory disease is a leading cause of death in Canada, accounting for approximately 10% of all deaths.<sup>55</sup> In Canada in 2000-2001, approximately 11% of hospitalizations were due to respiratory diseases.<sup>56</sup> Over 3 million people of all ages in Canada were coping with serious respiratory diseases in 2001, and the expenses associated with these diseases account for nearly \$12.18 billion of expenditures per year, including direct and indirect costs.<sup>57</sup>

Many of the studies examining the link between periodontal disease and lung disease focus on nosocomial (hospital-acquired) pneumonia, or community-acquired pneumonia. In Canada, nosocomial pneumonia may be the second most common type of infection acquired in hospital. It is associated with the highest mortality rate<sup>57</sup> and substantial morbidity in intubated, mechanically ventilated clients.<sup>58,59</sup> In acute care hospitals, as many as 13.7% of patients develop this infection.<sup>60</sup> The seriousness of hospital-acquired infections is underlined by the Canadian Nosocomial Infection Surveillance Program, in place since 1995. A 2005 report from the surveillance program indicates that rates of nosocomial acquisition of methicillin-resistant *staphylococcus aureus* (MRSA) are on the rise with the rate of .91 out of 1000 admissions in 1997

increasing to 3.66 out of 1000 admissions in 2001.<sup>61</sup> In the United States, reported mortality rates from nosocomial pneumonia range from 20% to 50% and estimates place the total costs of this complication at \$1.2 billion per year.<sup>62</sup> In Canada, community-acquired pneumonia accounts for 60,000 hospitalizations per year costing \$100 million.<sup>62</sup>

Several biological mechanisms are hypothesized to explain the link between poor oral health and pneumonia.<sup>1,63-66</sup> (See figure 2.)

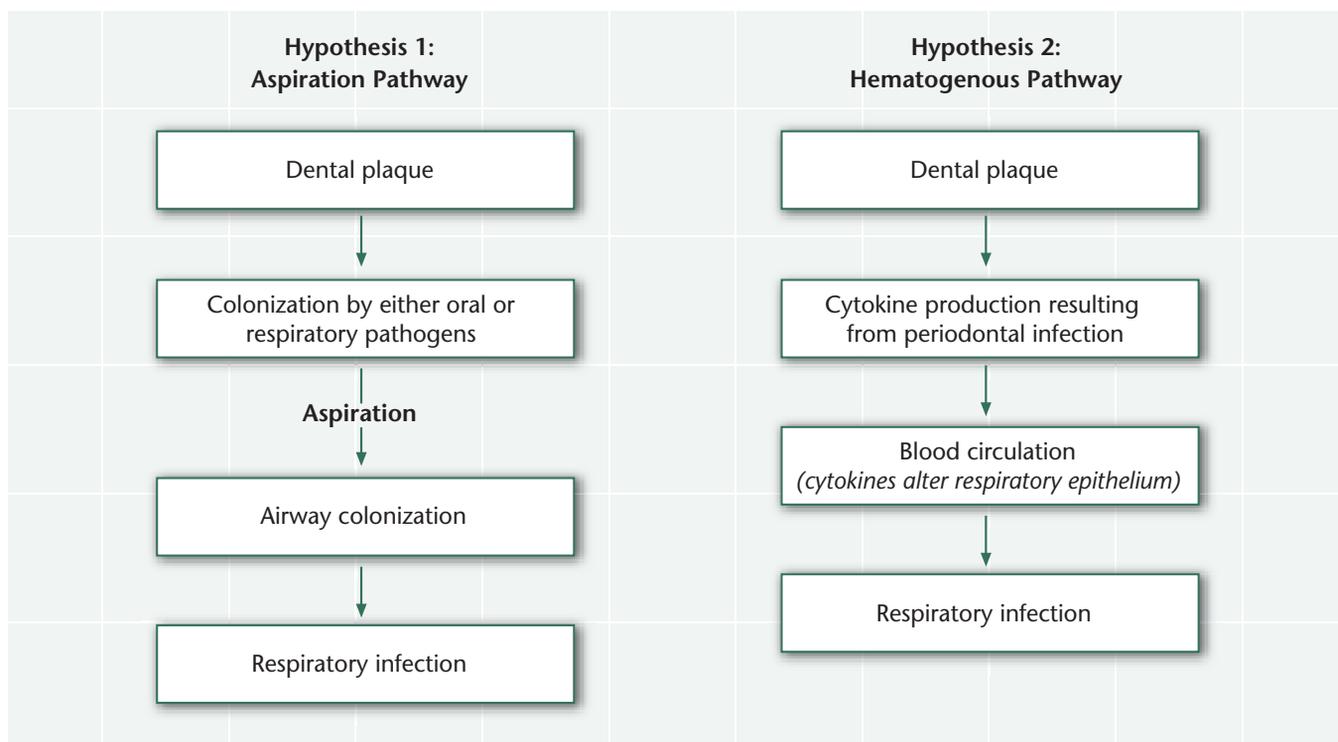
- Respiratory pathogens colonize the oral cavity, dental plaque, and oral mucosa. These pathogens may be aspirated into the lower airway to cause infection in health compromised clients.
- Cytokines originating from periodontal tissues may enter the blood and contribute to respiratory inflammation.

## RESULTS

A 2006 Systematic Review classified the research evidence using the Canadian Task Force on Preventive Health Care: Quality of Evidence and Grades of Recommendations.<sup>67</sup> Using evidence from 5 studies (four prospective cohort and one case-control,<sup>68-72</sup> they conclude that there is fair evidence of an association between respiratory diseases and oral health concludes (II-2, grade B recommendation). The odds ratio ranged from 1.2 to 9.6, depending on the oral health indicators. Using evidence from 10 studies (9 clinical trials, 3 non-randomized,<sup>73-82</sup> they found good evidence (I, grade A recommendation) that improved oral hygiene and frequent professional oral health care reduces occurrence of respiratory diseases among high-risk elderly adults in long-term care facilities and intensive care units. There was a low number needed to treat (NNT = 2 to 16) and a high relative risk reduction (RRR =34% to 83%). Using the evidence from four poor-to-fair studies,<sup>83-86</sup> they found a weak association between periodontal disease and chronic obstructive pulmonary disease (COPD).

A 2003 systematic review of 21 studies reports on the impact of periodontal disease and other indicators of poor oral health on the initiation or progression of pneumonia.<sup>87</sup> The following studies on pneumonia in intensive care and nursing homes were included: 11 case control and cohort,<sup>68-72,83,88-93</sup> and 7 controlled trials (5 randomized).<sup>73,76-80,94</sup>

A large variety of different interventions were included in the 7 controlled trials, including the following: regular cleaning of the oral cavity vs. regular oral hygiene; PNV (150mg of polymyxin B sulfate, 1g of neomycin sulfate, 1 g of vancomycin hydrochloride per 60mL of 5% dextrose) solution vs. placebo; chlorhexidine (CHX) oral rinse vs. placebo; CHX vs. isotonic bicarbonate and oropharyngeal aspiration; CHX oral rinse with ventilator weaning protocol (WP) vs. placebo and WP; topical antimicrobial prophylaxis: orabase® with gentamicin/colostin/vancomycin vs. placebo control: orabase® without antibiotics vs. control: no treatment; professional dental care once/day, plus gargling swabbing with povidone iodine. A meta-analysis of the 5 randomized controlled trials with institutionalized



**Figure 2.** Proposed biological mechanism for respiratory infection

clients showed that a number of oral hygiene interventions, such as mechanical and/or topical chemical disinfection or antibiotics, reduced the incidence of nosocomial pneumonia by an average of 40%, in high-risk subjects.

Three additional intervention studies were published following the 2003 systematic review. They are included in this review as two of them are lengthy studies and the third is an RCT, which provides substantive weight to the argument for a connection between periodontal disease and respiratory disease. The findings from these studies are consistent with the systematic review findings. The first study examined 141 elderly persons in nursing homes who received weekly oral health care by dental hygienists for 24 months. The researchers found a ratio of fatal aspiration pneumonia that was significantly lower in the treatment group (2/40) than in the control group (non-treatment) (8/48) ( $p < .05$ ).<sup>74</sup> The second study was a randomized clinical trial that included 561 subjects who were undergoing heart surgery.<sup>75</sup> The treatment group received Peridex 0.12% chlorhexidine gluconate oral rinse and the control group received Listerine (phenolic mixture). For the patients intubated for more than 24 hours, the pneumonia rate was reduced by 58% ( $P = .06$ )

The third additional intervention study followed 417 participants from 11 nursing homes for two years. The participants were randomly assigned to an oral care group or a control group who received no oral care provided by caregivers or dental hygienists.<sup>81</sup> In the former group, nurses or caregivers brushed the residents' teeth after each meal with no dentifrice, and a dental hygienist or a dentist administered plaque and calculus control as necessary once each week and povidone iodine was used in some

cases. Pneumonia and death from pneumonia were both significantly lower in the oral care group, with a relative risk (RR) of 1.67 (95%CI= 1.01-2.75,  $P < .05$ ) for the former and an RR of 2.40 (95%CI = 1.54-3.74,  $P < .01$ ) for the later. The edentate and the dentate residents showed similar results.

## DISCUSSION

The conclusion from this research is that there may be an association between periodontal disease and pneumonia. There are 12 high-quality randomized controlled trials (RCTs) that provide moderate evidence of a link between periodontal disease and nosocomial pneumonia in institutionalized clients and evidence that oral hygiene (mechanical or chemical approaches) may reduce the incidence of pneumonia. The low number needed to treat (NNT = 2 to 16), combined with a high relative risk reduction for pneumonia (RRR = 34% to 83%), provides solid evidence for a call for dental hygienists to work with high-risk elderly adults in long-term care facilities and intensive care units.

These conclusions are consistent with the biological evidence indicating that pneumonia can be the result of anaerobic bacteria.<sup>95</sup> Dental plaque with anaerobic bacteria seems to be a logical source of the bacteria that causes pneumonia.

Given that dental hygiene services are inexpensive and easy to deliver and that pneumonia causes significant morbidity, mortality, and cost to the health care system, dental hygiene services may have a significant impact on individual's lives and reduce health costs. It is less costly to provide dental hygiene services than to treat a client with pneumonia in a hospital setting. In fact, some of the costs

have been estimated: the cost of using Peridex in one hospital to try to prevent nosocomial pneumonia in all cardiovascular surgery patients was \$700 a year, less than 10% of the cost associated with a single case of nosocomial pneumonia.<sup>75</sup> Oral rinses are inexpensive and easy to apply and may be readily used in hospital and long-term care settings.

Given that many seniors in long-term care facilities have poor oral health due to difficulty accessing professional oral health care and inadequate personal oral hygiene care,<sup>96</sup> it may be warranted to provide high-risk seniors in long-term care and hospital settings with access to oral health services. In addition, there should be increased collaboration and communication between dental hygienists and long-term care facilities, and critical care units of hospitals. These new opportunities can focus on oral/general health assessments, leadership capacity, policy development, surveillance, program delivery and evaluation.

One of the drawbacks of attempting to combine the results from the randomized controlled trials (RCTs) is that there was a high degree of difference in the interventions in the studies. Therefore, there is a need for increased RCTs that focus on the same treatment approach. This may help to strengthen the evidence. In addition, determining a causal relationship between periodontal disease and pneumonia will require a meta-analysis of high-quality RCTs. Also needed are large RCTs comparing different types of intervention with high-risk clients to determine the impact on nosocomial- and community-acquired pneumonia. Since there is growing international research on this topic, there is also a need to develop international standards. These would allow the pooling of original data, which would avoid the possibility of combining the odds ratios and P values from two non-significant studies that may give significant results. There is also a need for ongoing research to clarify if periodontitis or higher levels of oral bacteria and biofilm are implicated in the relationship with respiratory disease. This would clarify the need to focus on plaque and biofilm removal, or the periodontal diseases themselves.

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## Agents of Change (continued from page 3)

sigh of relief upon the confession. Then we yet again attempt to somehow convince and inspire a change in the clients' habits over the course of the next hour. How is it that we ourselves are convinced of the distinct benefits of this daily ritual yet are constantly frustrated when we do not see a change that translates into the desired outcome? Despite our best efforts, we continue to see the effects of poor oral hygiene.

But we can make a difference, however small, if we persevere. I challenge every dental hygienist to identify one small change that he or she can bring about and to commit to working toward a successful outcome. What can you do to create more opportunities within our profession to make this happen? What can you do as an individual? My personal goal for this year is to reach out to as many

professionals as possible and work together to raise the profile of dental hygiene as a profession.

In my last message to you, I reflected on the new beginning that is perceived each fall. As we begin a New Year, we are again presented with a new beginning. As we watch the ball drop in Times Square, we celebrate the end of the old and rejoice in the new. This is when we resolve to change old habits. This year, let's all resolve in our own way to move our profession forward by changing the way we view our ability to make oral health promotion a part of every Canadian's life.

Pray for a good harvest, but keep on plowing (Nancy Otto).

You can reach the president at [president@cdha.ca](mailto:president@cdha.ca). 

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## Sondages sur le travail et adhésion à l'ACHD (suite de la page 7)

tats de qualité à partager avec vous pour que vous puissiez influencer sur le changement. Cette information sera mise à votre disposition pour vous aider à négocier des salaires et des avantages sociaux justes et équitables.

Lorsqu'un grand nombre de personnes répondent à un sondage, la qualité des résultats s'améliore. Notre sondage sur le travail demandait les mêmes questions aux hygiénistes dentaires d'un océan à l'autre. En faisant cela, nous (et vous aussi) serons en mesure de comparer les résultats d'une juridiction à l'autre. Vous pouvez utiliser cette information pour satisfaire votre curiosité ou pour influencer sur le changement au sein de votre propre organisation.

Vous pouvez répondre à ce sondage sur papier ou en ligne – à votre choix. Comme vous le savez, dans d'autres sondages, nous vous demandons de commenter en ligne sur les exposés de position, les produits et les processus afin que vous puissiez influencer non seulement l'ACHD mais également l'industrie de la santé buccodentaire. Nous apprécions que vous preniez le temps de nous faire part de vos pensées et de vos préférences et, quand cela est possible, nous aimons récompenser ceux et celles qui participent. Notre partenariat avec différentes entreprises nous a permis, l'an dernier, d'attribuer un téléviseur grand écran à haute définition et une chaîne de cinéma maison ainsi que des certificats cadeaux de divertissement et divers produits de soins de santé buccodentaire.

Ces sondages et leurs résultats (plus les commentaires intéressants et motivants qui les accompagnent parfois) sont envoyés aux membres de l'ACHD ou sont mis à la disposition des membres dans la section *Réservé aux membres* de notre site Web ([www.cdha.ca](http://www.cdha.ca)). Ils ne représentent qu'un des nombreux avantages de l'adhésion et j'aimerais souligner les trois autres avantages en ligne qui sont liés à l'adhésion à l'ACHD.

La formation continue représente une part importante de notre développement professionnel. Qu'il y ait des exigences de FC formelles ou non dans votre province, il

est essentiel de rester à jour sur les recherches et les procédures cliniques les plus récentes et sur les questions d'actualité qui affectent votre profession. Nous offrons en ligne des cours de FC et un abonnement au DVD *Journal of Dental Hygiene* à des tarifs réduits. En tant que membre de l'ACHD, vous pouvez, à chaque année d'adhésion, profiter d'un cours de FC en ligne gratuit. Vous pouvez également suivre l'évolution de tous vos cours de FC à l'aide de l'outil de gestion du développement professionnel auquel vous pouvez accéder par la page « Formation continue ».

En tant que membre de l'ACHD, vous pouvez maintenant magasiner en ligne à la Boutique ACHD où des articles de marque ACHD et d'autres articles peuvent être achetés à rabais. De plus, à la Boutique vous pouvez également faire des économies substantielles sur des abonnements à des centres de conditionnement physique, des téléphones cellulaires, des produits électroniques, des locations d'auto, des réservations d'hôtels et beaucoup plus encore grâce à notre programme Affinité-partenaire.

Nous venons juste également de lancer le programme de reconnaissance en hygiène dentaire de l'ACHD pour reconnaître les efforts et les réalisations des membres, qu'elles ou ils soient hygiénistes dentaires praticiennes/praticiens ou étudiantes/étudiants en hygiène dentaire. Nous sommes en mesure d'offrir une variété de prix innovateurs grâce aux contributions des partenaires corporatifs de l'ACHD. Plus d'information est offerte en ligne concernant le processus d'inscription, les catégories et les directives de présentation.

Nous vous invitons à nous faire parvenir vos commentaires par courriel, téléphone, télécopieur ou lettre concernant nos sondages pour connaître vos points de vue sur ce qui se passe dans la communauté des hygiénistes dentaires. Prenez quelques instants pour explorer le site Web de l'ACHD, et tout spécialement la section *Réservé aux membres*. Ainsi, vous renforcerez vos liens avec vos collègues hygiénistes dentaires, la profession et votre organisation. 

# Pacifier- and Digit-Sucking Habits

by Erik Larsson\* and Samir Bishara†

## ABSTRACT

During the 20th century, the incidence of artificial sucking habits has increased while digit sucking has relatively decreased. This phenomenon is of concern to parents and clinicians as well as those involved in preventive health care. Greater harm to the dentition is caused by digit sucking than artificial sucking, both because the thumb acts as a lever, forcing the maxilla forward, and because the habit is harder to stop. Artificial sucking habits, however varied, are common in the industrialized world of today, the main reason being that breast-feeding is reduced both in intensity and in duration. Crossbite and tendencies to crossbite should be carefully checked in two to three year olds with artificial sucking habits.

Dr. Erik Larsson from Oslo University, Norway, has studied these problems for more than 30 years and has written several articles about his investigations. With Dr. Samir Bishara of the University of Iowa as editor, Dr. Larsson published his results and ideas in a book entitled *The Influence of Oral Habits on the Developing Dentition and Their Treatment: Clinical and Historical Perspectives*.<sup>1</sup> (See [www.thumbandpacifiersucking.com](http://www.thumbandpacifiersucking.com)). The following article is taken from sections of this book.

**Keywords:** breast feeding; cephalometry; fingersucking; malocclusion; pacifiers; sucking behaviour

## HISTORY

FOR UNCOUNTED MILLENNIA, HUMANS RAISED THEIR children with mothers breast-feeding their children for two to three years. On-demand breast-feeding was most common; the child was allowed to suckle when and as much as it wanted. In some cultures, the use of wet nurses was also common.

In the mid-18th century, William Hunter, a Scottish doctor, emphasized the need for mothers to breast-feed their children to minimize the risk of developing “milk fever.” This is now scientifically described as “stagnation mastitis” and often referred to as “caked breast.”

In more modern and industrialized societies, women started to schedule breast-feeding in set periods of four to six times per day and also reduced the length of time the baby was allowed to breast-feed. This in turn increased the child’s need for additional sucking time to satisfy the sucking urge. In some cultures, it was common to provide the child with a knotted strip of cloth that contained honey or other foods for the child to suck on. The concept is similar to the use of the modern pacifiers introduced in the second half of the 19th century.

In this article, we attempt to provide an overview of digit- and pacifier-sucking habits, their etiology, and their effect on the developing dentition.

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† Dr. Bishara has been professor of orthodontics at the University of Iowa since 1976. He obtained his dental and specialty degrees from Alexandria University, Egypt, and the University of Iowa.

## PREVALENCE AND DURATION

The prevalence of non-nutritive sucking habits varies in different cultures as well as within the same culture at different time periods.<sup>1</sup>

Numerous studies have examined initial sucking habits in young children.<sup>2-13</sup> Especially interesting are Larsson’s studies from a small county in southwest Sweden where the sucking habits of children born in this region have been recorded over a long period (table 1). As can be seen from this table, initial pacifier sucking has increased and digit sucking has decreased.

Year born	Sample size	% initial pacifier sucking	% initial digit sucking
1961 <sup>3</sup>	920	45	30
1967 <sup>12</sup>	3,563	55	22
1980-82 <sup>13</sup>	280	72	23
1986 <sup>14</sup>	171	70	18
1995-97 <sup>9</sup>	60	72	10

**Table 1.** Initial pacifier and digit sucking in Skaraborg County, Sweden

When comparing the initial and continuing sucking habits of 60 three-year-old girls in seven different areas of the world, Caglar et al.<sup>2</sup> registered a considerable difference in both digit and pacifier sucking. The digit-sucking prevalence data were rather low except for Iowa in the United States where half of the girls started a digit-sucking habit. Initial pacifier sucking was fairly popular in most areas with a prevalence of up to 70%–80% in Sweden and

## RÉSUMÉ

Au cours du 20<sup>e</sup> siècle, l'incidence des habitudes de succion artificielles a augmenté alors que la succion des doigts a relativement diminué. Ce phénomène présente un intérêt spécial pour les parents et les cliniciens ainsi que pour les personnes qui travaillent en soins de santé préventifs. La succion des doigts cause un plus grand tort à la dentition parce que le pouce agit comme un levier, poussant le maxillaire vers l'avant, et parce que l'habitude est difficile à perdre. Les habitudes de succion artificielles variées sont communes dans le monde industrialisé d'aujourd'hui, la principale raison étant que l'allaitement maternel a diminué en intensité et en durée. L'occlusion croisée et les tendances à l'occlusion croisée devraient être soigneusement vérifiées chez les enfants de deux à trois ans qui ont des habitudes de succion artificielles.

Le Dr Erik Larsson de la Oslo University, à Norway, a étudié ces problèmes depuis plus de 30 ans et a écrit plusieurs articles sur ses recherches. Avec le Dr Samir Bishara de la University of Iowa comme éditeur, le Dr Larsson a publié ses résultats et ses idées dans un livre intitulé *The Influence of Oral Habits on the Developing Dentition and Their Treatment: Clinical and Historical Perspectives*.<sup>1</sup> (Voir également [www.thumbandpacifiersucking.com](http://www.thumbandpacifiersucking.com)). Cet article est un extrait de son livre.

Brazil. The exception was in Nigata, Japan, where none of the girls had started a pacifier sucking habit.

Children who start digit sucking often have greater problems abandoning the habit than do pacifier suckers. Larsson<sup>3</sup> found that half the children who started a digit-sucking habit still sucked at the age of seven. Similar results have recently been shown by Bishara et al.<sup>4</sup> Girls seem to have more problems stopping than do boys.<sup>3</sup>

### THUMB AND FINGER SUCKING

#### Etiology and development of digit sucking

The exact etiology of digit-sucking habits is still not clear but is thought to primarily satisfy the sucking that infants need. There are several different hypotheses regarding the etiology of prolonged finger sucking.

*There is a negative relationship between the prevalence of initial pacifier-sucking habit and initial digit sucking.*

#### Psychoanalytic theory

Freud described his concept of the etiology of thumb sucking by stating the following: "It is clear that the action of the thumb sucking child is determined by the fact that it seeks a pleasure which has already been experienced and is now remembered." He then adds, "The first and most important activity in the child's life, the sucking from the mother's breast (or its substitute), must have acquainted it with this pleasure. We would say that the child's lips behaved like an erogenous zone."<sup>15</sup>

Basically, the Freudian approach considered the sucking mechanism as an instinct. Freud also considered thumb sucking as a form of infantile sexuality, beginning initially as a reflex mechanism, but continuing when the infant finds that it can derive pleasure beyond its normal nutrient sucking needs. According to Freud's theories, the oral zone is the first erogenous zone within which the baby could feel satisfaction. The oral zone, the sucking urge, as well as the need for safety and satisfaction by getting food, are closely related. If this urge is not satisfied—because of insufficient breast-feeding, for example—a digit-sucking habit can emerge. Also according to Freud, prolonged thumb sucking is a symptom of a mental disturbance. He talks about regression into the habit and fixation of the habit.

#### Learning behaviour theory

According to this theory, the sucking habit provides the baby with satisfaction and reduces anxiety and therefore a prolonged thumb sucking is not a symptom of a severe mental problem. However, the sucking habit itself can become a problem if the child cannot stop the habit as it gets older. More specifically, the thumb sucking may cause the child to be insecure and may interfere with social interactions.

#### Unphysiologic reduction of breast-feeding

An alternative but complementary theory has been suggested by Larsson and Dahlin.<sup>16</sup> Simply stated, if the sucking need is not satisfied at the breast, the infant's fingers will be used as a substitute. Early in life, the habit will be stimulated by hunger or if the child is tired, unhappy, idle, or under stress.<sup>17</sup> Larsson and Dahlin<sup>16</sup> pointed out the extreme differences in prevalence and duration of breast-feeding between the contemporary rearing of babies and that of earlier societies. In earlier societies as well as among some traditionally reared people still living today, the children were breast-fed on demand for two to three years.

### Finger sucking habits and malocclusion

A number of studies<sup>5,6,18-20</sup> indicated an increased incidence of malocclusion in individuals with persistent sucking habits when compared with children with no history of the habit. According to Bowden,<sup>6</sup> the proportion of Skeletal Class II relationships was higher among the digit suckers (40%) and dummy suckers (35%) than among the non-suckers (29%). In addition, there was a significant increase in the incidence (62%) of the Skeletal Class II relationship in children where digit sucking persisted until eight years of age.<sup>6</sup>



**Figure 1.** A less-frequently observed approach for sucking the fingers in a 3-month-old girl. Note that the dorsal surface of the fingers is toward the palate.<sup>1</sup> (p.33)

The position of the fingers while sucking influences the direction of the displacement of the anterior teeth. There is typical thumb sucking with the ventral side of the finger facing the palate and maxillary incisors. A second way is sucking with the dorsal side of the finger facing upward (see figure 1). Here, if the finger or fingers are passive, the effect would be similar to sucking on a pacifier but this type of finger sucking is relatively less common.

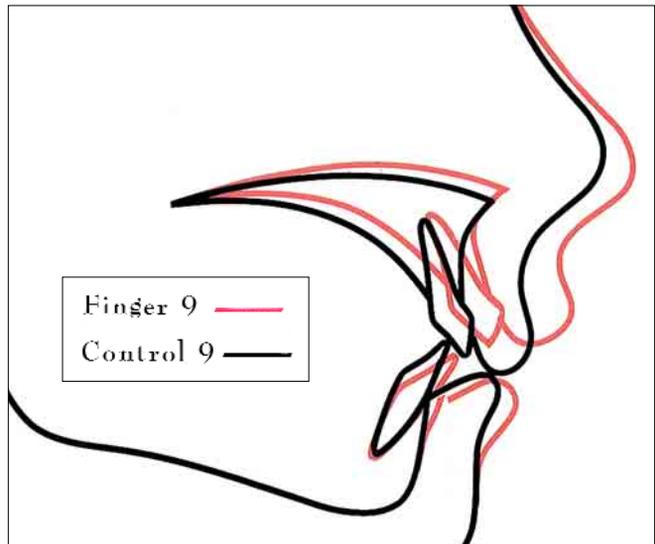
### Effect of the finger habits on the dentition

#### Dental changes

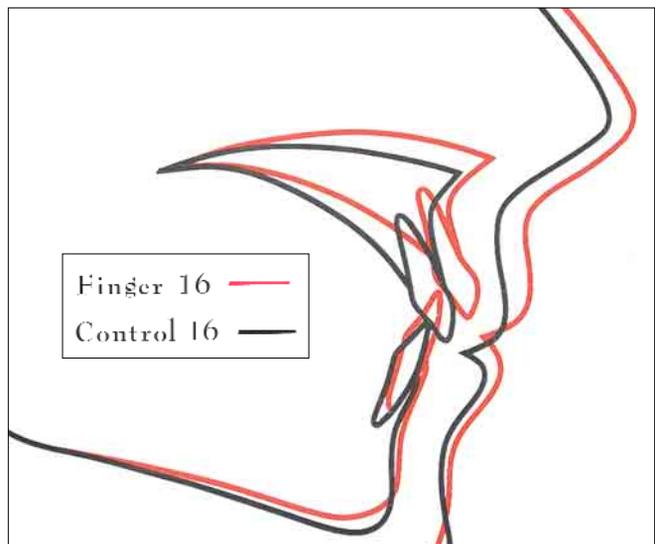
A typical clinical picture of a persistent finger habit includes anterior open bite, as well as an increased overjet, that are the result of the labial inclination of the upper incisors.<sup>6,18-20</sup> The lingual inclination of the lower incisors, although suggested in the literature, is not necessarily the typical picture. Subtelny and Subtelny,<sup>21</sup> as well as Larsson<sup>19</sup> and Moore<sup>20</sup> in their cephalometric studies, found that the lower incisors' inclination in digit suckers was not significantly different from that in non-suckers. The prevalence of a transverse discrepancy increases markedly among children who continue the habit vigorously beyond two or three years of age.<sup>7</sup>

### Cephalometric changes

Larsson, in a series of longitudinal studies, evaluated a group of Swedish children who had persistent finger habits until nine years of age.<sup>19,22,23</sup> He found significant maxillary incisor protrusion and upward tipping of the palatal plane with an anterior displacement of the maxilla (see figure 2a). In the children who discontinued the habit between 9 and 12 years of age, there was "uprighting"—the proclination/inclination was reduced—of the maxillary incisors and a progressive closing of the anterior open bite. At 16 years of age, these children displayed upper lips that were more anteriorly positioned relative to the control group with maxillary apical bases displaced anteriorly. The upward tilting of the palatal plane remained (see figure 2b).



**Figure 2a.** Average cephalometric tracing of 116 nine-year-old digit suckers compared with 100 children without a previous sucking habit<sup>23</sup>



**Figure 2b.** Average cephalometric tracing of 51 sixteen-year-old previous digit suckers compared with 39 children without a previous sucking habit<sup>23</sup>

## Treatment

The effect of prolonged digit sucking is often considerable and the need for orthodontic treatment often high. Attempts to stop a digit-sucking habit should be made when the patient has a post-normal molar relationship or is developing in that direction. There are, of course, also psychological reasons for stopping a sucking habit. A 10-year-old digit sucker is normally embarrassed because of the habit. If the patient wants to stop a digit-sucking habit and the effects are mainly limited to the anterior part of the dentition, a removable plate with a palatal crib can be used. The acrylic should be relieved palatal to the incisors to allow them to retrocline when the habit ceases. A fixed palatal arch with a crib can also be used and sometimes is more effective because it eliminates the need for the patient's cooperation.<sup>1</sup> If a child with prolonged digit-sucking habit is treated with a fixed appliance, the child's mental health should be carefully observed. (For more information, see Larsson.)<sup>1</sup>

## PACIFIER SUCKING

### Etiology and development of pacifier sucking

The etiology of a pacifier-sucking habit is probably the same as for finger sucking. For millions of years, children had unrestricted breast-feeding for the first two to three years of life. More recently, on-demand breast-feeding has been replaced by more strictly scheduled breast-feeding for a few months, supplemented and/or replaced by bottle feeding.

### *Several studies have revealed an increased incidence of posterior crossbite in the primary dentition in pacifier-sucking children.*

As can be seen from table 1, there is a negative relationship between the prevalence of initial pacifier-sucking habit and initial digit sucking. The figures in table 1 support the belief that pacifier sucking may often prevent the child from developing a thumb-sucking habit.

This hypothesis is strongly supported from the results of a study by Zadik et al.<sup>8</sup> See also another relevant study by Larsson.<sup>9</sup> In the Zadik et al. study, parents and nursery staff in one kibbutz in Israel were instructed not to use the pacifier while parents and staff in another kibbutz were given the opposite recommendation. In the kibbutz where pacifiers were recommended, about 70% of the children started to suck a pacifier and a few became digit suckers. In the other kibbutz where pacifiers were prohibited, the pacifier suckers were few but the thumb suckers were about five times as many as in the first kibbutz.

Obviously, if the child gets a suitable pacifier at a young age, it will probably develop a pacifier-sucking habit. If not, the risk that the child will become a digit sucker will increase considerably.<sup>8,9</sup> (See table 1.)

## Pacifier sucking and breast-feeding

Pacifier sucking has had a bad reputation throughout most of the 20th century and the habit was actually condemned at the beginning of the 1900s. Recently, several studies from "Baby-Friendly Hospitals" have reported significant associations between pacifier use and early weaning.<sup>24-28</sup> The World Health Organization recommends avoiding the early use of pacifiers.<sup>29</sup> However, Kramer et al. in a comprehensive study concluded that "pacifier use is a marker of breastfeeding difficulties or reduced motivation to breastfeed, rather than a true cause of early weaning."<sup>30</sup>

Larsson also questioned the WHO recommendation.<sup>1</sup> In his material, initial pacifier sucking increased from 55% in 1971 to 72% in 1997. On the other hand, during the same period, breast-feeding at six months of age increased from 4% to 67%.

## Pacifier sucking and malocclusion

### *Effects of pacifier sucking on the primary dentition*

Since pacifiers are normally used before the teeth have erupted, they may hinder the full eruption of the primary incisors as well as the growth of the alveolar processes, resulting in an anterior open bite (see figure 3). In those rare cases when the child still sucks a pacifier at the time of the eruption of the permanent incisors, the anterior open bite can be significant. Sometimes several pacifiers are tied together with one in the mouth and the others hanging outside (see figure 4). This extra weight can act as a lever, affecting the dentition in a similar way as digit sucking.

In most children, the use of the pacifier is discontinued by three or four years of age and incisal contact is established in a relatively short time. Also, in older children, a spontaneous correction often occurs. (See figure 5.)

### *Effects on the posterior occlusion*

Several studies<sup>7,10,11,18</sup> have revealed an increased incidence of posterior crossbite in the primary dentition in pacifier-sucking children. The prevalence of posterior crossbite among three-to-four-year-old pacifier suckers from the county of Skaraborg in southwest Sweden rose from 13% to 20% between 1975 and 1990. The incidence of crossbite was especially high in girls, 26%.<sup>10</sup> (See figure 6.)

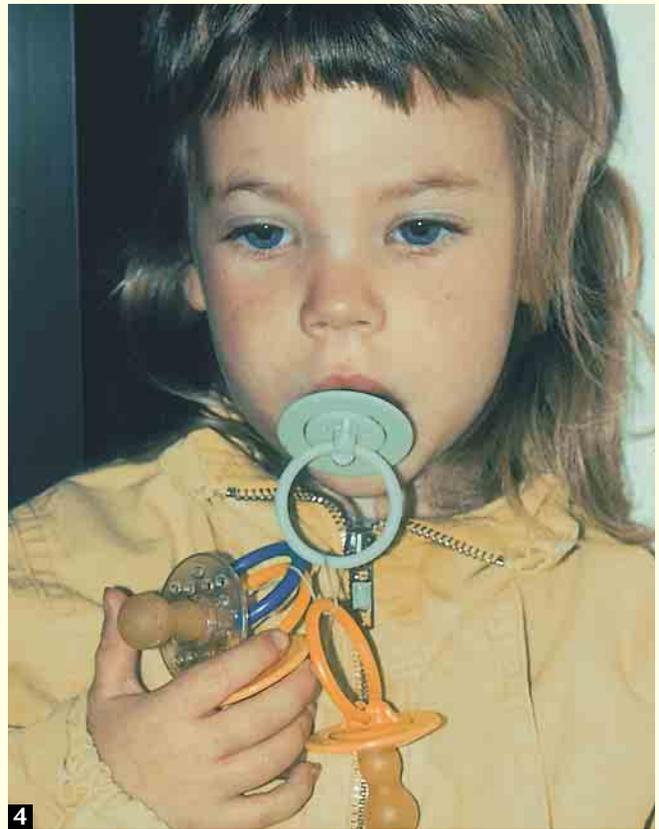
A probable reason for the correlation between pacifier sucking and crossbite is that when the teat of a pacifier is kept in the mouth for extended periods, changes will occur in the surrounding tissues. The tongue will occupy a lower position in the anterior part of the mouth, reducing the palatal support of the upper primary canines and molars against the pressure of the cheeks. The tongue will exert increased lateral pressure on the lower canines and first molars. The lack of palatal support from the tongue will result in a narrower upper arch, and the pressure of the tongue will widen the lower arch. Both these changes act synergistically to create a transverse disharmony that will increase the tendency for a posterior crossbite to develop.<sup>11</sup>

In a longitudinal study, Larsson followed 60 consecutively born girls from the Falköping area in Sweden.<sup>9</sup> In this prospective study, parents were informed about the



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**Figure 3.** A three-year-old pacifier sucker with a typical effect of the habit on the occlusion<sup>1</sup> (p.40)



4

**Figure 4.** Several pacifiers tied together will create an extra oral weight, which could make the pacifier act like a lever.<sup>1</sup> (p.40)

**Figure 5.** An eight-year-old boy with a continuing pacifier sucking habit (left) and eight months after breaking the habit (right)<sup>1</sup> (p.42)

**Figure 6.** Interfering contacts on the primary canines (left), resulting in a posterior crossbite with mid-line shift (right)<sup>1</sup> (p.42)



5



6



risk of developing a crossbite with the use of the pacifier and were asked to reduce the “in-the-mouth time” of the pacifier. The findings from the study indicated that only 2 of 39 girls (5%) who were still pacifier-suckers at three years of age had developed a posterior crossbite.

These results suggest that it is possible to significantly reduce the risk of developing a crossbite in pacifier suckers by asking the parents and the staffs of nurseries to reduce the time the pacifier is in the child’s mouth. Further evaluation of these cases has also indicated that in some instances a spontaneous improvement can take place if the sucking habit stops.

Can these results be explained? According to Proffit,<sup>31</sup> pressure against the teeth has to exist for at least 6 hours out of 24 to result in tooth movement. Differences in the number of hours per day that children spend with the pacifier in the mouth, plus the sucking intensity, could probably explain why some children develop a posterior crossbite more than others.

***From an orthodontic perspective, the main reason for allowing pacifier sucking is that it reduces the incidence of digit-sucking habits.***

## **Treatment**

### *Need and timing of treatment*

Today, children often place the pacifier in their mouth almost full-time. It should be pointed out that in these cases, the pacifier seems to act as a substitute for non-nutritive feeding or unrestricted breast-feeding of earlier practices. Professionals dealing with pacifier-sucking habits should attempt to prevent the child from using the pacifier incorrectly by educating the parents. Such information can minimize many problems. The need for physical contact between the mother and the baby should also be stressed.

From an orthodontic perspective, the main reason for allowing pacifier sucking is that it reduces the incidence of digit-sucking habits. If children are forced to break the pacifier-sucking habit at an early age (before two or three years of age), there is a risk that they will develop a digit-sucking habit instead.<sup>3</sup> This risk is greater for girls. One should therefore have good reasons for trying to break a pacifier-sucking habit early.

### *Factors to consider*

1. In most cases of pacifier sucking, the anterior open bite may close spontaneously when the habit terminates.
2. If the difference between the upper intercanine arch widths and that of the lower is less than 3 mm, the risk of posterior crossbite developing should be considered high and the parents should be encouraged to reduce the pacifier-sucking time.<sup>7</sup>
3. The transverse relationship between the dental arches should be evaluated in pacifier-sucking children at

the age of two to three years. If interfering contacts between the primary canines exist, the parents should be instructed to reduce the “in-the-mouth time” of the pacifier. One idea is to let the child use the pacifier only for a short time after meals and when going to sleep. Occlusal equilibration might need to be performed to eliminate the interfering contacts.

4. If a unilateral crossbite develops in combination with a forced lateral guidance of the mandible, this should be treated as soon as possible by equilibrating the primary dentition to adjust the occlusion or by the use of an expansion appliance.
5. In those rare cases in which it is decided to try to break a pacifier-sucking habit, a positive reinforcement method is recommended. With this approach, the therapist, the child, and the parents should decide to break the habit on a special day some months ahead. A suitable day to choose is the last school day before a holiday. The child selects four or five small presents for the parents to buy. On the appointed day, the child brings all his/her pacifiers to the therapist. As an encouragement, the child receives one of the presents bought earlier each day for the next four to five days.

## **CONCLUSION**

Artificial sucking habits, however varied, are common in the industrialized world of today, the main reason being that breast-feeding is reduced both in intensity and in duration. Crossbite and tendencies to crossbite should be carefully checked in two to three year olds with artificial sucking habits. However, greater harm to the dentition is caused by digit sucking, both because the thumb acts as a lever, forcing the maxilla forward, and because the habit is harder to stop.

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# Reflections on Conducting Structured Interviews with a Senior Population and Participating on a Research Team

by Nancy R. Neish, DipDH, BA, MEd

## ABSTRACT

The Seniors Oral Health Assessment Project (SOHAP) was a pilot phase of an epidemiological survey designed to test the practicality of using survey methods to measure the oral health of seniors aged 65 and older. The study included indices to measure oral health status, and structured interviews to determine the impact of oral health on the seniors' quality of life. The SOHAP assessed seniors from rural and urban Nova Scotia living independently in the community, in assisted living facilities, or long-term care institutions. A precise structured interview format was followed and 150 seniors completed the questionnaire.

This commentary outlines some of the challenges involved in conducting structured interviews using an oral health-related quality of life questionnaire with a senior population and provides examples of unexpected situations that can arise during the interview. Some important traits for researchers conducting these interviews are a gentle tone of voice, active listening, empathy, non-judgmental acceptance, and respect for the subject participants (SPs). The author believes it is possible to conduct quality structured interviews and maintain a compassionate presence for the participants being interviewed.

**Keywords:** data collection; elderly; interviews; questionnaires; interviews

## INTRODUCTION

IN THIS COMMENTARY, I SHARE MY REFLECTIONS ON THE process of conducting structured interviews with a senior population and participating as a member on a research team. These reflections are based on my experience with the Seniors Oral Health Assessment Project (SOHAP).

The Seniors Oral Health Assessment Project was a pilot phase of an epidemiological survey that was designed to test the practicality of using survey methods to measure the oral health of seniors aged 65 and older. The study included indices to measure oral health status and structured interviews to determine the impact of oral health on the seniors' quality of life. This paper focuses on the process and challenges of conducting structured interviews using an oral health-related quality of life questionnaire with a senior population. The SOHAP assessed seniors from rural and urban Nova Scotia who were living independently in the community, in assisted living facilities, or long-term care institutions. One hundred and fifty seniors completed the questionnaire administered in a precise, structured interview format. The data and methods used to gather the data for this pilot phase will be examined and modified by the principal investigators before they conduct a larger survey of seniors living in the four Atlantic provinces. Data from the larger survey will be used in the development of public programs to manage seniors' oral health.

In preparation for the project, practice interviews were videotaped, discussed, and reviewed with the complete

research team as well as the interviewees. Based on the results of these discussions, further modifications were made to the oral health-related quality of life questionnaire. Two dental hygienists who were part of the research team conducted the structured interviews.

## STRUCTURED INTERVIEW METHODOLOGY

The co-principal investigators for this project chose the structured interview method because the strengths of this method best suited the purpose of the research. Some of the strengths of structured questioning are the following: forced choice responses through a limited selection of possible answers are obtained; a large cohort can answer questions in a relatively short period; responses can be compared across groups; and statistical analysis can be conducted to describe and compare responses.<sup>1</sup> One hundred and fifty interviews were conducted in nine different locations in urban and rural areas around Nova Scotia. In many cases, the interviewers also completed the subject participant's (SP's) medical history prior to the interview. The interview usually preceded a dental exam. Either before or after the dental exam, the dental hygienists conducting the interview would include oral hygiene instruction/education for the SP and give them oral hygiene aids to thank them for participating in the project. Snacks were also served at the end of this process.

In addition to being a part of the research team, the interviewer's role is to serve as a link between the researcher seeking the information and the SPs who provide the information. During a structured interview, it is

## RÉSUMÉ

Le *Seniors Oral Health Assessment Project* (SOHAP) était une phase pilote d'une enquête épidémiologique conçue pour vérifier la valeur concrète de l'utilisation d'une méthodologie d'enquête par sondages pour mesurer la santé buccodentaire des personnes âgées de 65 ans et plus. L'étude incluait des indices pour mesurer l'état de santé buccodentaire et des entrevues structurées pour déterminer les répercussions de la santé buccodentaire sur la qualité de vie des personnes âgées. Le SOHAP évaluait des personnes âgées des régions rurales et urbaines de la Nouvelle-Écosse vivant de façon autonome dans la communauté, dans des résidences assistées ou dans des établissements de soins de longue durée. Un modèle d'entrevue structurée précis a été suivi et 150 personnes âgées ont rempli le questionnaire.

Ce commentaire expose les grandes lignes des défis que comportait la conduite d'entrevues structurées avec une population âgée en utilisant un questionnaire portant sur la qualité de vie liée à la santé buccodentaire et donne des exemples des situations inattendues qui peuvent survenir durant une entrevue. Certains traits importants pour les chercheurs menant ces entrevues sont un ton de voix doux, une écoute active, de l'empathie, une acceptation non-critique et le respect des sujets participants (SP). L'auteur croit qu'il est possible de mener des entrevues structurées de qualité et de maintenir une présence empreinte de compassion pour les participants interviewés.

important for the interviewer to read the questions exactly the way they are written in the questionnaire, to speak audibly, and to make sure the study participants' answers are accurately recorded. Additionally, the interviewer needs to understand the questionnaire and the principles for using it.

The oral health-related quality of life questionnaire used in this project was composed mainly of forced choice questions where SPs selected from a list of possible answers the one that best described their situation. A few questions were open-ended where the interviewer wrote by hand the SP's response verbatim directly on the questionnaire.

Interviewers were given interviewing guidelines, many of which were adapted from National Health and Nutrition Examination Survey (NHANES) Dental Recorders Procedures Manual.<sup>2</sup> These rules, in an abbreviated form, were as follows:

1. Always read the question as written so that every SP hears the same question in the same way.
2. Ask the questions in the way they are ordered in the questionnaire.
3. Read questions in a natural conversational tone, following the punctuation in the question. Emphasize only the words that are underlined or appear in bold.
4. Read the questions at a slow, even pace.
5. Do not show the questionnaire to the SP.

Guidelines were provided for adding probing questions. In this case, probing refers to techniques used to refocus or redirect the SP's attention to the question being asked. These techniques are designed to help the interviewer find a way to get the SP to elaborate or reconsider an incomplete or inappropriate answer without influencing the content of the answer.

To maintain the integrity of the questionnaire, and to avoid changing the meaning of the question or influencing the SP's answer, interviewers were instructed not to clarify a question for a SP, but just to repeat the question. Further, interviewers were not allowed to define a word or phrase unless it was provided in the specific directions for a particular question.<sup>2</sup>

These rules and guidelines make sense in theory and in many cases can be adhered to with little difficulty.

However, in my experience, adhering to these guidelines was challenging when actually conducting a structured interview with a senior population with varying educational levels and cognitive abilities. The purpose of this commentary is to articulate some of the challenges and to share insights and lessons learned from participating in this research project.

## THE SOHAP RESEARCH TEAM

The SOHAP team consisted of two co-principal investigators, a research assistant/administrator, two dentists, a dental assistant, a dental student, and two dental hygienists, all from the Faculty of Dentistry at Dalhousie University, Halifax, Nova Scotia. The dental hygienists were the team members responsible for conducting the interviews. The approach to this research project was collaborative in nature.

A quote from the book *Coming to Our Senses* by Jon Kabat-Zinn describes the underlying strengths of the SOHAP research team.

All of us, no matter who we are or where we live, have certain things in common. For the most part we share the desire to live our lives in peace, to pursue our private yearnings and creative impulses, to contribute in meaningful ways to a larger purpose, to fit in and belong and be valued for who we are, to flourish as individuals and as families, and as societies of purpose and of mutual regard, to live in individual dynamic balance, which is health, and in a collective dynamic balance, what used to be called the 'commonweal', which honors our differences and optimizes our mutual creativity and the possibility for a future free from wanton harm and from that which threatens what is most vital to our well-being and our very being.<sup>3</sup>

The phrases "to contribute in meaningful ways to a larger purpose" and "which honors our differences and optimizes our mutual creativity" seem to capture the underlying motivation of the SOHAP team. The purpose of research on a global level is "to understand and improve the human condition."<sup>4</sup> Participating in research that has the potential to ultimately contribute to a larger purpose





such as improved oral health care for seniors inspires one to work harmoniously and effectively for the benefit of others.

## REFLECTIONS

### Examples of challenging interviews

Obtaining an accurate medical history was a problem in some cases. Depending on the SP's memory or cognitive ability, the accuracy of the information obtained in the medical history was questionable. In institutions where medical records were made available to us, there were often discrepancies between the medical records and the SP's information given verbally. Also, the questions in the medical questionnaire triggered particular memories in the SPs that were unexpected responses for me, as the interviewer. In one case, when I asked a SP (who had Alzheimer disease) about "alcohol use," she told me she did not drink at all. Then she told me that her father had been an alcoholic who had made her mother's life miserable. As she thought about this, she started to cry and told me she could never forgive her father even though she knew she should. At this point, I wasn't sure how to proceed. I asked the SP if she felt like continuing or if she would prefer not to. She told me she would like to continue. The combined interview and medical history took almost two hours. I felt responsible for saying something to someone who could help this woman since it was obvious she was having difficulty with this unresolved part of her life. In the end, I contacted the supervisor who was our contact at this institution to pass along the information in the hope the SP could receive counselling.

### *I found myself appreciating the richness of their stories, their beauty, vulnerability, and honesty.*

In another case, I had just completed the medical history of a bright, alert, independently living woman who was 84 years old when she stated, "I'm ready to leave this earth. I don't know why I'm still here." She told me about the untimely and unexpected death of her 24-year-old granddaughter and wondered why she was still here and her granddaughter wasn't. She confided that she did not want her family to know she had been seeing a psychologist because she felt her mother "would roll over in her grave" and her kids would think she was crazy. She said the visits had been really helpful and she wanted to go back to the psychologist. She told me many details of the circumstances surrounding the death and the impact it had on both she and her son. She asked me if I thought she should go back to the psychologist. I responded by saying it was important for her to do whatever she found helpful and nurturing and not to worry about what her family or others may think. She seemed relieved and said she was going to make another appointment with her psychologist. The rest of the interview went smoothly.

A third example is an interview with a war veteran who had been diagnosed with Alzheimer disease. When I began the interview by explaining the structured interview process (this was done for all SPs), he was distraught and began to cry. He told me he had been a prisoner of war and had been interrogated during his captivity. He said he was really afraid he wouldn't get his answers "right." I explained to him that there were no right or wrong answers. We were just interested in what was true for him based on his experience. I told him I appreciated his taking part in the study and he was free to discontinue the interview if he felt distressed. He seemed satisfied with this because he did complete the interview and appeared to be relaxed and in good humor.

### Personal impact on the interviewer

These last three stories are examples of some of the things that may happen during interviews for which you really can't prepare but rather just respond to "in the moment" and trust your response is beneficial rather than harmful.

The SPs came from varied backgrounds and had their own unique style of expressing themselves. I found myself appreciating the richness of their stories, their beauty, vulnerability, and honesty. At times I felt uncomfortable making small talk while waiting with them for their dental exam but if the SP led the conversation, it was fine. I remember asking one SP about her family, only to discover that her three children had predeceased her when they were in their fifties. I realized I needed to be very careful in what I chose to ask or comment on!

There were times when I felt emotionally exhausted after interviewing, particularly when painful and emotional information had been shared with me. I was a witness to their vulnerability and suffering. In my experience, this happened frequently when interviewing an elderly population on an individual basis. The SPs have your undivided attention and there was a tendency for them to digress from the formal structure of the interview. I felt it would be rude to cut them off when they were sharing this personal information. As researchers, we were trying to build a good working relationship with the SPs as well as the site contact people who had recruited the SPs and scheduled the interviews in the different communities where we conducted the interviews. It was important that the SPs and the contact people felt they were being treated with respect or they would have withdrawn from the study. They would also not want to participate in future studies of this nature, so building a solid working relationship and rapport was an important part of the process.

This raised a question I think about from time to time. What was really more important, collecting the data for the study or providing a compassionate, non-judgmental space for people to express what they needed to say? I suppose from the researcher's point of view, it is the former and from the participants' point of view, the latter. However, based on my experience, I would make a strong case for allowing the SPs the time they need to be heard.

There are certain observations I made that will not show up in any of the formal, written publications con-





cerning this project but they are worth sharing. These observations are not part of the formal data that was collected.

- The majority of SPs who participated in this project were conscientious about answering all questions as accurately and thoroughly as possible.
- Many SPs indicated they didn't think the results of the study would help them, but if their information could help others, they felt it was worthwhile to participate. They thought by the time changes to oral health care for seniors were made as a result of this study, it would be too late for them.
- Almost all SPs were punctual for their interview appointment.
- It was hard to predict how long an interview would take. The same interview ranged from less than half an hour to almost two hours.
- Most SPs preferred to have me ask them the questions on the medical history rather than fill it out themselves. In some cases, this was due to poor vision and ability to read the medical history questionnaire.
- Other issues were often raised such as the shortage of (medical) doctors in rural Nova Scotia and the hardship to couples when one partner was living in a long-term care facility and the other partner had to live independently in the community.
- In some cases, and for various reasons, SPs were living in a facility far from the community where they had lived most of their lives and they found this to be a difficult adjustment.
- Many SPs expressed the feeling that they didn't have much to offer to our study. Some participants thought we were interested only in people who still had their natural teeth and if they had dentures, their information was not useful.
- Generally speaking, the SPs were helpful and kind. They did not seem to mind the amount of time it took and seemed glad to have helped us.
- Many of the SPs declined the refreshments offered at the end of their visit. The reason most often given was that they were being careful with their diet.

## LESSONS LEARNED

The following observations are based on my experience after participating in the pilot study. They relate to both the interviewing process and to being a member of a research team.

### Interviewing

- Ideally, the designated interview room should be comfortable for a two-way conversation. It should be a quiet area, easily accessible by the SP. The room should be at a comfortable temperature and preferably should have a window. To ensure confidentiality, the interview should be in a place where others cannot hear the conversation.

- It is best if other family members are not present for the interview unless they are needed. On occasion, SPs brought their grandchildren to the interview because they were caring for them. We felt some of the questions were of a sensitive nature and having older children present who were capable of understanding the questions could be inappropriate.

### Research team considerations

- In a study where travelling a distance is required, it is important to ensure the safety of the team by providing overnight accommodations. Driving long distances before the interview, interviewing, and then driving a long distance back in one day increases the risk of accidents. The interviewers need to be alert and focused for the interviews, so rest and good nutrition are important considerations that need to be included in the research funding.
- Good communication among team members is essential. The research assistant arranged debriefing sessions after each site visit so team members could fine-tune the process and make appropriate travel arrangements and schedules to accommodate the needs of each member of the research team.
- Working with seniors brought to the fore our own feelings and beliefs around sickness, old age, and death. This was a time for personal reflection and insight in the context of what we knew from the literature on seniors and their oral health now combined with our personal experience. As a team, we found it personally supportive to have the opportunity to discuss these beliefs and feelings with each other.
- Balancing time was a challenge for team members. All members of the research team had full-time work responsibilities in addition to participating in this study. An important consideration when planning a study is to include release time for the team for the duration of the study. Collecting the data for this study took place over a two-month time period with no release time provided. If the data collection had required a longer time commitment, it is unlikely it would have occurred if there was no release time from other daily work responsibilities.

## CONCLUSIONS

Conducting structured interviews is a viable and frequently used method for collecting data.<sup>1-2,4-10</sup> This commentary outlines some of the challenges involved in conducting structured interviews with a senior population and provides examples of unexpected situations that can arise during the interview.

Some important traits for researchers conducting structured interviews are a gentle tone of voice, active listening, empathy, non-judgmental acceptance and respect for the SPs. If the goal of research is to improve the human condition, it makes sense to conduct the research in a way that allows the participants to have their needs met on some level. If SP feel listened to and respected, their relationship

with dental researchers will be enhanced and they may be more willing to complete the interview and participate in the research. The fact that SPs digress from the process and disclose personal information seems to indicate they have a need to feel heard and understood. I believe it is possible to conduct quality structured interviews and maintain a compassionate presence for the participants being interviewed.

Based on my experience, I encourage dental hygienists to participate in similar research activities. Dental hygienists have been educated to establish a rapport and communicate effectively with clients. They possess the skills necessary for conducting structured interviews, collecting clinical data within the scope of dental hygiene practice and contributing to scientific literature.

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### Agents de changement (suite de la page 3)

moment est différent de tous les autres. Rien ne demeure un seul instant immuable, que ce soit considéré à partir d'un point de vue moléculaire ou d'un point de vue planétaire. Que nous l'apprécions ou pas, le changement est inévitable – chaque jour, nous nous ajustons et nous nous adaptons à l'univers changeant qui nous entoure. Néanmoins, nous ressentons de la frustration lorsque nous essayons en vain de réaliser des changements. Je ne peux aider mais je pense aux efforts que nous, comme hygiénistes dentaires, déployons pour changer les habitudes buccodentaires de nos clients. Je trouve toujours intéressant de voir comment les clients avouent ouvertement qu'ils n'ont pas utilisé la soie dentaire sur leurs dents depuis leur dernière visite et poussent ensuite un soupir de soulagement après cet aveu. Puis, une fois de plus au cours de la prochaine heure, nous tentons tant bien que mal de convaincre le client et de susciter un changement dans ses habitudes. Comment se fait-il que nous, qui sommes convaincues des nets avantages de ce rituel quotidien, soyons néanmoins constamment frustrées lorsque nous ne voyons pas le résultat désiré à la suite d'un changement ? En dépit de nos efforts exceptionnels, nous continuons à voir les effets d'une pauvre hygiène buccodentaire.

Mais nous pouvons faire une différence, même petite, si nous persévérons. Je demande à chaque hygiéniste den-

taire d'identifier un petit changement qu'il ou elle peut provoquer et de s'engager à travailler pour l'atteinte d'un résultat favorable. Que pouvez-vous faire pour créer plus de possibilités à l'intérieur de notre profession pour que cela se produise? Que pouvez-vous faire en tant qu'individu? Mon objectif personnel pour cette année est de soutenir le plus de professionnels et professionnelles que possible et que nous travaillions ensemble à rehausser le profil de l'hygiène dentaire en tant que profession.

Dans le dernier message que je vous ai adressé, je faisais ressortir le nouveau début qui est perçu à chaque automne. Lorsque nous commençons une nouvelle année, nous faisons face encore à un nouveau début. Alors que nous regardons la fin du bal à Times Square, nous célébrons la fin de la vieille année et nous nous réjouissons de l'arrivée de la nouvelle. C'est le moment où nous prenons la résolution de changer les vieilles habitudes. Cette année, prenons tous et toutes la résolution de faire avancer, à notre propre façon, notre profession en changeant la manière dont nous voyons notre capacité d'arriver à ce que la promotion de la santé buccodentaire fasse partie de la vie de tous les Canadiens et les Canadiennes.

Priez pour une bonne récolte, mais continuez à sarcler. (Nancy Otto)

On peut communiquer avec la présidente à l'adresse <[president@cdha.ca](mailto:president@cdha.ca)>.

## CDHA Board — Highlights of Meeting

October 21, 2006, Ottawa

### Annual General Meeting

- 1. Appointment of directors:** The board approved the appointment of the following directors. All will be serving until 2009. **Evie Jesin** for Ontario (2nd term); **Maureen Bowerman** for Saskatchewan (1st term); **Palmer Nelson** for Newfoundland and Labrador (2nd term); **Lucy Scharfenberger** for Alberta (1st term).
- 2. Audited statements:** The board approved the audited final statement ending April 30, 2006, and the selection of auditors for the next year, McCay, Duff and Company.

### Board of Directors Meeting

- 1. Monitoring reports:** The board members received and approved the CEO monitoring reports as well as the board monitoring reports.
- 2. Review of governing policies:** The board members received and approved the governing policies. The executive director will be investigating confidentiality policies of other professional associations. The board will solicit tenders for auditors every five years.
- 3. Dental hygiene education in Canada:** CDHA will be working with other stakeholders such as the Commission on Dental Accreditation of Canada, the National Dental Hygiene Certification Board, and the Federation of Dental Hygiene Regulatory Authorities to review the learning outcomes for dental hygiene education in Canada.
- 4. Provincial/organization reports:** The board members received provincial/organization reports from all provinces, DHEC, the military, and the NDHCB.
- 5. CDHA Student Summit:** A student summit is scheduled for January 20, 2007, in Toronto.
- 6. Dates for next meetings:** The next CDHA Board meeting is March 1–4, 2007. The International Symposium on Dental Hygiene, “The Many Cultures of Dental Hygiene,” is scheduled for July 18–21, 2007.

## National Dental Hygienists Week™



### CDHA Successfully Boosts the Oral Health of Women in YWCA Shelters

CDHA joined forces with the YWCA to celebrate National Dental Hygienists Week™ and YWCA, Week Without Violence.™ What do an anti-violence campaign and a dental hygiene campaign have in common? Many women who are fleeing violence find shelter at the YWCA. Due to financial hardship, these women do not have access to

oral health services. CDHA arranged a donation of toothbrushes from Crest Oral-B. CDHA members, practising dental hygienists, and students in Banff, Lethbridge, Peterborough, Quebec City, Toronto, and Vancouver donated their time and expertise to provide workshops on oral health promotion and oral disease prevention as well as free clinical services to these women. Volunteer dental hygienists found this a rewarding experience and women in the shelters expressed their gratitude. The CDHA member volunteers made a strong impression at the YWCA, which is interested in future partnerships with the dental hygiene profession. YWCA Vancouver plans to include dental hygienists in their career mentorship program with women in grades 11-12 and YWCA Toronto plans to include dental hygienists in their “Safe Sisters Program” for young girls aged 9 to 11.

**A grand round of applause for CDHA member volunteers and Crest Oral-B for making this event a resounding success.**

## Call for Nominations

### CDHA Distinguished Service Award

The CDHA Distinguished Service Award recognizes a dental hygienist or other individual who has made a significant contribution over a minimum four-year period to the advancement of the dental hygiene profession in Canada or nationally to the Canadian Dental Hygienists Association.

Eligible individuals are those whose contributions may include, but are not limited to, outstanding work on a task force or committee, work on an innovative project, work on the Board of the CDHA or any of the Board's committees, academic advancement, and/or corporate support. The individual's contribution and service to the profession must be national in focus, show personal commitment, and have had a positive impact on the profession.

The nomination must be supported by the following documentation to be considered:

- a cover letter from the principle nominator, outlining the nominee's contributions to the CDHA
- a letter of support from one additional nominator which should include aspects of the nominee's life and career
- brief reflection of the project(s) or positions the nominee has been involved in with regard to the dental hygiene profession at the national level

The CDHA Board of Directors will designate the Distinguished Service Award recipient at their meeting in March 2007. Please submit your completed nomination, together with all supporting documentation, no later than February 23, 2007, to the CDHA Office. Submitted nominations and documents will be kept confidential and will be used by the CDHA only for the award nomination process. Only completed nominations with all the necessary documentation will be considered. The award will be presented in July 2007.

## CDHA Life Members

CDHA Life Membership is awarded to an active member, in good standing, of the Canadian Dental Hygienists Association who has made an outstanding contribution to both dental hygiene and the association at the national level.

Dental hygienists nominated for Life Membership shall fulfill the following qualifications:

1. They will have maintained continuous CDHA membership in the active category for a minimum of 15 years.
2. They will have been involved in dental hygiene at the national level and in an official capacity for a minimum of 10 years.
3. They will have made a significant contribution to the growth and achievement of the national association, compared with others involved for the same length of time and in similar capacities.

For nominations to be considered by CDHA, we require the written support of two CDHA members in good standing. Nominators may submit only one nomination for this award. Submissions must be accompanied by a detailed curriculum vitae of the individual being nominated, as well as an outline of accomplishments at the national level that the nominators consider worth of this award.

The CDHA Board of Directors will designate the Life Member Award at their Board meeting in March 2007. Please submit your recommendations no later than February 23, 2007, to the CDHA office. Life Membership will be bestowed in July 2007.

## National Dental Hygienists Week™ – April 15–21, 2007

National Dental Hygienists Week™ is an annual event to heighten awareness about preventive oral health care, and to help Canadians understand the role and importance of the dental hygiene profession. CDHA, as the collective voice of dental hygiene in Canada, is proud to sponsor National Dental Hygienists Week™. This event has now moved to April (rather than October as in previous years).

Dental hygienists in every province and territory will be marking NDHW™ in diverse and creative ways. Activities are most often community outreach events, and often include contests, classroom presentations, mall displays, tours of dental offices, and much more! This is the perfect week to remind clients that a healthy mouth is much more than a great smile. Regular brushing and flossing, a healthy diet, and visits to your dental hygienist contribute to a lifetime of talking, eating, and smiling.

Join us, April 15–21, 2007, in celebrating National Dental Hygienists Week™.

## DHEC News – 2006

DHEC/EHDC held its annual meetings in June 14–15, 2006 in Edmonton, Alberta, just prior to the CDHA Annual conference. On June 15, the Board meeting was held in the morning, followed by the Dental Hygiene Program Directors' lunch meeting, educators' workshop, and the annual general meeting. The day finished with the Wine and Cheese Social and the presentation of the *Award for Teaching Excellence* to Mickey Wener from the University of Manitoba.

In 2006, two new members were welcomed to the Board. Alexandra Sheppard from the University of Alberta accepted the position as representative for Alberta. Pat Grant from Dalhousie University accepted the position as representative for the Atlantic Provinces. Members of the current Board of Directors are as follows: President Linda Jamieson, Ontario Director; Past President Dianne Gallagher, Director-at-Large; President-elect Sharon Compton, Director at Large; Bonnie Blank, Director-at-Large CDHA; Ginny Cathcart, BC Director; Alexandra Sheppard, Alberta Director; Brenda Udahl, Saskatchewan Director; Joanna Asadoorian, Manitoba Director; Louise Bourassa, Quebec Director; Pat Grant, Atlantic Director; Laura Myers, Director-at-Large, Francophone Representative.

The Directors held a strategic planning meeting in Edmonton to build on the previous strategic planning session (2005). The Vision, Mission, and Objects of DHEC/EHDC were reviewed and the final versions (see below) approved by the general membership at the AGM.

**Vision Statement:** Dental Hygiene Educators Canada/Éducateurs en hygiène dentaire du Canada DHEC/EHDC is committed to stewardship of a collaborative, national, proactive approach to the art and science of dental hygiene education.

**Mission Statement:** DHEC/EHDC advocates for the pursuit of excellence in teaching and learning, and educational leadership and research. DHEC/EHDC promotes quality dental hygiene education that includes advanced educational opportunities. DHEC/EHDC collaborates with stakeholders to accomplish its vision.

**Objects:**

- Foster excellence in teaching and learning.
- Promote the art and science of dental hygiene education.
- Encourage development of educational leadership and research
- Facilitate the exchange of information and expertise to develop dental hygiene education in Canada.
- Promote inter-professional alliances with national and international education and health organizations.
- Govern responsibly and maintain communications with members and stakeholders

The Board then reviewed DHEC/EHDC's purpose, completed an assessment of external challenges and opportunities, and considered the organization's strengths and weaknesses. The outcomes from the workshop included amendments to the DHEC/EHDC objects and identification of a number of priorities which the Board will continue to work toward over the coming year. One of these priorities is the affiliation agreement with CDHA for administrative support as it was recognized the development and work of DHEC/EHDC with only volunteers is slow. This affiliation will allow volunteers to shift from administrative to project work.

At the June 15 lunch meeting of Dental Hygiene Program Directors, the status of the *CDHA Policy Framework for Dental Hygiene Education in Canada* (revised 2000) was discussed. Dental Hygiene Directors expressed concerns over the lack of national direction on the development of dental hygiene undergraduate education and questioned where the *Policy Framework* was in relationship to implementation. The concerns were taken to the Executive of DHEC/EHDC and plans were made to schedule a meeting with Susan Ziebarth, Executive Director for CDHA, to discuss the concerns raised.

The annual *Educator's Workshop* had over 50 educators and focused on evaluation, specifically on using rubrics to assess student learning. Well-designed evaluation rubrics can be very beneficial to the evaluation process and plans are in process to post examples of rubrics on the website.

The day finished with a well-attended social function and a special presentation to Mickey Wener who received the 2006 *DHEC/EHDC Award for Teaching Excellence*. Laura MacDonald, a long-time dental hygiene colleague and friend of Mickey's, presented the award with the following words: "Mickey possesses the qualities of the expert educator—she has the ability to take content and magically formulate interactive, engaging learning activities for students and her teaching peers.... She is that kind, endearing, attentive, stern and disciplined, diplomatic, organized, coaching, refreshing, creative, enlightening, and reflective educator—the kind whom students over and over again claim as their 'favourite teacher.' She was one of mine too."

DHEC/EHDC is a growing, developing organization for dental hygiene educators and if you are not a member, we encourage you to join. Please look at the website ([www.dhec.ca](http://www.dhec.ca)) for more information. In 2007, the annual events of *DHEC/EHDC* will be held on July 18, prior to the IFDH conference in Toronto, July 19–21, 2007.

Editor's note: This article was published originally in French in the July-August 2006 issue of the journal (Vol. 40, No. 4). Due to the number of requests for an English version, we are publishing a translated version of the article.

# Evaluation of Toothpastes and of the Variables Associated with the Choice of a Product

by the Comité dentifrice of Collège François-Xavier-Garneau:\* France Lavoie, DH, BA, MA; Nancy Feeney, DH; Lucie Mc Callum, DH; Marie-Josée Paquet, PhD, Chemistry; Yvon Fortin, BSc, Physical Sciences; Denis Nadeau, Tech., Physical Sciences; Andrée Duhamel, BSc, Microbiology; Diane Lefebvre, Lab Tech.; Monique Roy, BSc, Chemistry; Sophie Boudreau, Tech., Chemistry; Louise Lefebvre, DH, BSc

## ABSTRACT

**Background:** Some 200 toothpastes are available on the Canadian market, and the abrasiveness of most of them is unknown. The most recent Quebec abrasiveness scale, dating from 1994 and evaluating only 60 products, is both incomplete and out of date. Moreover, the large number of manufacturing methods complicates product comparison in terms of, for example, abrasiveness, pH, and water-insoluble material. **Method:** In 2004 and 2005, an interdisciplinary team (dental hygiene, physics, chemistry, and biology) developed two new protocols for analyzing toothpastes. A machine simulated brushing on blocks of polymethylmethacrylate, which has similar properties to human dentin. The equipment included a vacuum system, vortex, magnetic stirrer, desiccator, scale, pH meter, and stopwatch. A solution of 25 g of toothpaste and 25 g of distilled water was applied according to the equation  $F = 150 \text{ g} \times 120 \text{ mvts}/4 \text{ hours}$ . **Results:** As indicated by the manufacturers, most toothpastes reduce certain problems: caries (76%), staining (42%), tartar (26%), gingivitis (21%), and hypersensitivity (12%). One percent are multicare toothpastes and 55 products bear the Canadian Dental Association (CDA) seal. There are significant differences among toothpastes: abrasiveness ranges from 0 to 6; pH varies from 3 to 10, and flow from 0.1 to 10 ml in 10 seconds; foaming may differ by a factor of 3 from one brand to another. **Conclusion:** The choice of toothpaste has a major impact on the reduction of certain dental problems and the maintenance of oral hygiene.

**Key words:** toothpaste, pH, abrasiveness

## 1. INTRODUCTION

IN 2005, THERE IS A REAL LACK OF INFORMATION CONCERNING the abrasiveness of toothpastes. Dental care professionals have gaps in their knowledge, given that data available on abrasiveness have not been updated since 1994 when the last study by Désautels and Labrèche of Université de Montréal appeared.<sup>1</sup> Some manufacturers provide their own abrasiveness scale but their equipment and methodologies may vary, which makes comparison difficult.

Certain variables have been added to the process as these variables enable verification of practical factors related to brushing. Acidity may favour demineralization, which has already been studied with regard to toothpastes sold in Europe.<sup>2</sup> For example, we know that acid liquids increase the permeability of dentin.<sup>3</sup> In 2004, Josiak et al.<sup>4</sup>

published an article on flow, comparing paste and liquid toothpastes. The article concluded that liquid toothpaste released a greater quantity of fluoride on the enamel over different periods of time, which increases the tooth's resistance to caries. On the other hand, toothpastes are composed of numerous water-soluble and water-insoluble ingredients.<sup>5</sup> It is important to consider water-solubility since daily brushing is with water and not oil. (In their study, Désautels and Labrèche<sup>1</sup> used an oil mixture to prevent the bicarbonate from dissolving in water.) Since it is currently impossible to separate toothpastes based on their bicarbonate content, there is a risk of methodological bias. The interdisciplinary team solved this problem by including a new test, one for insoluble materials contained in toothpastes. Finally, foaming power is another important factor to consider for users of electric toothbrushes and for people with xerostomia, among others. A toothpaste evaluation kit<sup>6</sup> made it possible to verify this variable.

## 2. LITERATURE REVIEW

With interdisciplinary work, precision in terminology is required. We relied on the works of Wilkins<sup>7,8</sup> because these have been dental hygiene reference works for

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## RÉSUMÉ

**Problème.** Le marché canadien compte environ 200 dentifrices, dont l'abrasivité est en grande partie inconnue. Puisque la dernière échelle québécoise sur l'abrasivité n'évaluait que 60 produits et remonte à 1994, elle est aussi périmée qu'incomplète. De plus, la multiplicité des méthodes de fabrication complique la comparaison des produits, par exemple quant à l'abrasivité, au pH et aux matières insolubles. **Méthode.** En 2004 et 2005, une équipe interdisciplinaire (hygiène dentaire, physique, chimie et biologie) a établi deux nouveaux protocoles d'analyse des dentifrices. Une machine simulait le brossage sur des blocs de polyméthylméthacrylate, matière semblable à la dentine humaine. L'équipement incluait un système de vacuum, un vortex, un agitateur magnétique, un dessiccateur, une balance, un pH-mètre et un chronomètre. Une solution de 25 g de dentifrice et de 25 g d'eau distillée était appliquée selon l'équation  $F = 150 \text{ g} \times 120 \text{ mvts}/4 \text{ heures}$ . **Résultats.** Selon les indications des manufacturiers, la plupart des dentifrices réduisent certains problèmes : la carie (76 %), les taches (42 %), le tartre (26 %), la gingivite (21 %) et l'hypersensibilité (12 %); 1 % des dentifrices sont multisoins et 55 produits portent le sceau de l'ADC. Il existe d'importantes différences entre les dentifrices : l'abrasivité varie de 0 à 6, le pH de 3 à 10 et l'écoulement de 0,1 à 10 ml en 10 secondes; la mousse peut tripler d'une marque à l'autre. **Conclusion.** Le choix d'un dentifrice influence de façon importante la réduction de certains problèmes buccodentaires et le maintien de la santé dentaire.

**Mots clés :** dentifrice, pH, abrasivité

decades and in addition were translated from English into French in 1991. The ninth edition, which was published in 2005, covers the same data. Thus, *toothpaste* is defined as a substance used with a toothbrush or any other applicator to remove, for aesthetic or hygienic reasons, bacterial plaque, *materia alba*, and accumulated debris on the gums and teeth, and to apply specific preventive or therapeutic agents to the teeth.<sup>7,8</sup> As for the term *abrasion*, it corresponds to the action of an abrasive product<sup>9</sup> or to the pathological wear of components of the tooth surface because of an abnormal mechanical process.<sup>1</sup> Abrasion may be caused by a combination of several factors, for example, brushing frequency; the stiffness of the bristles; the pressure applied; and the pH, hardness, and abrasiveness of the toothpaste.<sup>10</sup>

With regard to the reference framework, toothpastes can be part of the environment, according to CDHA's process model,<sup>11</sup> which was inspired by Health and Welfare Canada's standards.<sup>12</sup> Forrest and Miller's model<sup>13,14</sup> is also very appropriate because it includes four factors that must be considered: scientific evidence, the customer, the professional, and the environment. All four factors were taken into consideration in this study.

### 2.1 General composition of toothpastes

The general composition of toothpastes (see table 1) has varied over time and in different countries. Oral hygiene products existed as early as 6,000 years ago,<sup>15</sup> and the Egyptians used a toothpaste whose recipe included iris flowers, among other ingredients. In eighteenth-century England, a paste for teeth and gums was imported from the Orient.<sup>10</sup> In 1991, Wilkins<sup>7,8</sup> studied the general composition of toothpastes.

According to *La chimie des produits cosmétiques*,<sup>16</sup> toothpaste formulas vary from one manufacturer to another. Thus, Wilkins arrives at slightly different percentages of ingredients.<sup>7,8</sup> The importance of this study is in the general picture it provides, even though it does not conduct a detailed analysis.

### 2.2 Factors related to abrasiveness

This section presents an overview of the mechanical concepts related to the loss of dental substance. It starts with Newton's equation, which explains force,<sup>17</sup> then examines the acidity of toothpastes, Mohs' particle hardness scale,<sup>18</sup> and the choice of toothpastes from the perspective of customers, manufacturers, and dental care professionals.<sup>19</sup> Forrest and Miller's model<sup>13,14</sup> proves very relevant to the study of toothpastes.

#### 2.2.1 Newton's equation

Newton's equation<sup>18</sup> brings together force, mass, speed, and time, all variables that are relevant in dentistry. The application of excessive force during brushing and the length of brushing time are important factors: excessive force can be harmful and can result, for example, in abrasion of the enamel or root, dentin exposure, gingival abrasion, and recession of the free gingiva.<sup>3</sup>

$$F = ma, \text{ or Force} = \text{Mass} \times \text{Acceleration (or speed and time)}$$

#### 2.2.2 Toothpaste acidity

The idea that pH is related to the abrasiveness of toothpastes may seem surprising in Canada, but in Europe many toothpastes indicate the pH.<sup>2</sup> For example, Elmex includes it in its advertising, which appears in the Swiss dental hygienists' journal.<sup>19</sup> In 1983, Lehne and Winston<sup>10</sup> focused on this variable, which has an impact on abrasion. Traditionally in dentistry, chemical wear corresponds more to erosion.<sup>3</sup> Acidity is relevant to our study because fluoride acts differently if the environment is neutral or acidic.<sup>20</sup> In addition, tooth demineralization can start at a pH of 6.5 for the root and 5.5 for the enamel.<sup>9</sup> According to the results of studies carried out on European toothpastes,<sup>2</sup> some toothpastes have a pH below the critical threshold (5.5). Moreover, acidity affects plaque control, tartar reduction, and the treatment of hypersensitivity.<sup>21</sup> Whitening toothpastes with peroxide tend to be acidic.<sup>22</sup> Bicarbonate of soda, on the other hand, has been

Percentage	Action	Ingredients
20% to 60%	<b>Cleansing and polishing agents</b> Abrasive compounds to clean teeth and polishing agents to obtain a smooth, shiny surface	Calcium carbonate, calcium pyrophosphate, dehydrated dicalcium phosphate, anhydrous dicalcium phosphate, insoluble calcium metaphosphate (IMP), hydrated aluminum oxide, silica, silicates and dehydrated silica gels, synthetic amorphous silicates in gel form, complex salt of synthetic amorphous aluminum silicate
20% to 40%	<b>Humectants</b> Substances used to retain water and prevent the product from air-drying	Glycerine, sorbitol, propylene glycol
15% to 50%	<b>Water</b>	Wilkins provides no further details
2% to 3%	<b>Preservatives, sweeteners, and dyes</b> Substances to prevent the spread of bacteria, give a pleasant taste, and make the product attractive	Preservatives: alcohols, benzoates, formaldehydes, dichlorinated phenol. Sweeteners: non-cariogenic artificial sweetener, sorbitol and glycerine (the latter two act as both humectants and sweeteners). Dyes: vegetable colouring.
1% to 2%	<b>Therapeutic agents</b> Medications or chemicals added for specific preventive or treatment purposes	For the time being, fluoridated toothpastes constitute the best preventive agent. Added antibiotics: penicillin, tyrothricin. Ammoniac and enzyme-inhibiting toothpastes for research on caries: N-lauryl sodium sarcosinate and sodium dehydroacetate.
1% to 2%	<b>Binders</b> Substances preventing liquid and solid ingredients from separating	Hydrophilic organic colloids such as alginates and synthetic cellulose derivatives
1% to 2%	<b>Detergents</b> Foaming agents or surfactants	Sodium lauryl sulphate, N-lauryl sodium sarcosinate, sodium cocomonoglyceride sulphonate
1% to 1.5%	<b>Fragrances</b> Compounds intended to make the toothpaste attractive and mask the taste	Essential oils, menthol, non-cariogenic artificial sweetener

**Table 1.** General composition of toothpastes

used as an antacid for centuries.<sup>9</sup> Tests measuring the acidity of toothpastes are therefore innovative.

### 2.2.3 Particle hardness

In 1812, Mohs established the hardness of 10 minerals and created a scale that is still used today. This 10-point scale classifies materials from softest (1) to hardest (10):

- 1 = talc, 2 = gypsum, 3 = calcite, 4 = fluoride,
- 5 = apatite, 6 = moonstone, 7 = quartz,
- 8 = topaz, 9 = corundum, 10 = diamond<sup>18</sup>

The hardness of the parts of the tooth and of certain abrasives contained in toothpastes was compared in 1983 by Lehne and Winston in *Clinical Preventive Dentistry*:<sup>10</sup>

- dentin: 2 to 2.5
- sodium bicarbonate: 2.5
- sodium dihydrate: 2.5
- calcium carbonate: 3
- anhydrous dicalcium phosphate: 3.5
- tooth enamel: 4 to 5
- calcium pyrophosphate: 5
- alumina: 9.25

The practical aspects of these scales are important to improve our understanding of abrasiveness measurements. For example, Désautels and Labrèche<sup>1</sup> used four

levels in their scale of abrasiveness, which ranges from 0 to 2 or more, where 0 corresponds to “not very abrasive” and 2 or more to “very abrasive.” Désautels and Labrèche’s ceiling level of 2 or more seems logical since it is equal to or greater than the hardness of dentin, a part of the tooth that is often exposed in adults. With a hardness index of 4 to 5, enamel is harder than dentin, which should permit the use of a more abrasive toothpaste if the dentin is not exposed, especially when one considers that the average length of time spent on brushing is about one minute.<sup>5</sup> Fluoride, which is at level 4 on the Mohs scale, is similar to enamel. Moreover, its action depends on its concentration: it can act as an abrasive,<sup>17</sup> antibacterial agent,<sup>20</sup> and anti-cavity treatment.<sup>7,8</sup> A toothpaste that contains alumina is effective at removing stains but it is very likely to damage the tooth surface as alumina is too hard, 9.25 on the Mohs scale.

The next section looks briefly at the various reasons why members of the general public choose particular toothpastes.

### 2.2.4 Factors related to the choice of a toothpaste

In general, the factors related to the choice of toothpaste vary from one group to another, based on each group’s interests. Thus, the general public, manufacturers, and dental care professionals may choose a toothpaste based

on cost, active agents, or marketing. Consequently, all these aspects must be taken into consideration.<sup>15,23</sup>

**A. The public** attaches particular importance to the cost of toothpaste, its appearance and aesthetic qualities—its taste, the foam that it produces, breath and the fresh, clean feeling that it leaves after brushing—and various aspects related to health such as its ability to prevent caries and bleeding gums. People want good-quality products that are quick and easy to use.<sup>15,23</sup>

**B. Manufacturers** offer the public products that the public finds attractive. For example, one of their strategies is to offer products that are recommended by professionals to prevent, as much as possible, oral and dental problems.<sup>23</sup>

- Marketing in reaction to the competition: To please consumers, the number of products on offer keeps growing.<sup>1</sup> For example, manufacturers launch toothpastes that are designed for dentures or the tongue, that are compatible with homeopathic products, non-foaming for electric toothbrushes, without preservatives, without fluoride, without dyes, without peroxide, without artificial flavours, etc. Recently, new products have been adapted for various health problems such as diabetes (with sweeteners that have no effect on blood sugar), xerostomia (adding salivary enzymes or decreasing foaming agents), or high blood pressure (without bicarbonate of soda or salt).

- The addition of therapeutic agents: The specific action of certain agents makes it possible to reduce oral health problems. For example, enzymes are added to pre-digest milk or to increase saliva, vitamin B or C to promote gum health, and amine or calcium fluorides to strengthen teeth and periodontal bones.

**C. Professionals** emphasize prevention and health promotion. They attempt to reduce risk factors such as using a very acidic toothpaste on a tooth with caries, or they recommend protective factors such as the use of a toothpaste containing fluoride.<sup>23</sup>

- There are two major toothpaste categories: those with a cosmetic function, which focus on appearance, and those with a therapeutic function, which contain agents that promote oral health. Legislation applies to therapeutic products with an ISBN code.
- Therapeutic toothpastes have existed for some 20 years. The market offers anti-tartar, anti-caries, anti-bacterial, desensitizing and other products designed to combat xerostomia, bad breath, stains, etc.<sup>9</sup> In exchange for a fee, the Canadian Dental Association (CDA)<sup>24</sup> may grant its seal to a therapeutic product if it complies with certain standards and is subject to a rigorous process including scientific studies.

Current data, although not exhaustive, allow us to formulate the principal question and the objective of this study, which was designed to evaluate the abrasiveness of toothpastes available in 2005. The general aim of the study is to update the data on toothpaste abrasiveness and certain variables associated with toothpastes: the level of insoluble materials, foaming power, viscosity, and pH. It would be possible to expand the literature review further.

### 3. METHODOLOGY

#### 3.1 Pre-tests

A number of pre-tests allowed us to verify the preparation of blocks of polymethylmethacrylate (PMMA); force, speed, and duration variables; the choice of materials used for the *in vitro* study; and the dilution of solutions for the abrasiveness, pH, viscosity, and foaming power tests. Vacuum assembly and choice of filters, and dilution with water and toothpaste for the insoluble materials test, were covered by additional procedures.

The design and manufacture of the brushing machine took several months. Désautels and Labrèche's<sup>1</sup> old model used five toothpastes in five compartments, whereas the new model has seven compartments. (See figure 1.) This permits two samples apiece of three toothpastes to be tested simultaneously, with the last compartment acting as a control. The seven toothbrush heads are inserted into small compartments designed for that purpose. The Oral-B brush was chosen for two reasons, its soft bristles and its rectangular head. Soft-bristle brushes are recommended for daily brushing, and the rectangular shape was selected because it has the advantage of wearing down the blocks of PMMA uniformly in the centre and at the edges, while presenting a flat surface. Since the handle of the Oral-B 40 is flexible, it was replaced by a rigid metal stem. The blocks of PMMA were placed in a pan divided into seven compartments. The equipment is relatively easy to clean between tests. In addition, a cover was added to reduce evaporation and splashing from particularly liquid toothpastes, among other things. (See figure 2.) A powerful motor made it possible to keep parameters consistent throughout the experiment, which would not have been the case with batteries. The equipment was attached to a large steel plate to avoid vibrations and maintain the precision of the adjustments. Given the sturdiness of the equipment, it will be possible to use it again when repeating the study.

The equation  $F = ma^{17}$  or  $F = mv/t$  allows us to compare the methodology of several studies of toothpastes. For example, Désautels and Labrèche<sup>1</sup> conducted their tests over 48 hours with a very low force, whereas Pickles and Joiner<sup>24</sup> completed the brushing in a few seconds but applied a high force (greater than 200 g), which Bowen<sup>5</sup> advises against, whether using manual or electric brushes. The Comité dentifrice opted for a force of 150 g, which is adapted to brushing, and a duration of four hours since certain toothpastes evaporated in five hours despite the cover.

Désautels and Labrèche's<sup>1</sup> equation:  $F = 55 \text{ g} \times 52 \text{ mvts}$  for 18 hours; solution made up of two-thirds toothpaste and one-third water

Pickles and Joiner's<sup>25</sup> equation:  $F = 375 \text{ g} \times 400 \text{ mvts}$  for a few seconds, solution made up of 38.5% toothpaste and 61.8% water

ADA<sup>26,27</sup> equation:  $150 \text{ g} \times 1500 \text{ mvts}$  for a few seconds; solution including radioactive isotopes in 10 g of toothpaste and 50 ml of 5% carboxymethyl cellulose, which results in RDA (radioactive dentin abrasion) or REA (radioactive enamel abrasion)

FXG equation:  $F = 150 \text{ g} \times 120 \text{ mvts}$  for 4 hours; solution made up of 25 g toothpaste and 25 g water

#### 3.2 Protocol

The method was based on Désautels and Labrèche's<sup>1</sup> study, which used weight to determine the abrasiveness of the toothpastes when measuring the wear of the PMMA blocks. Their study had the following steps: the PMMA blocks were cleaned with toluene, dried, and placed in the desiccator for 48 hours. They were then accurately weighed on the Mettler scale. Their weight could not exceed  $160 \text{ g} \pm 0.01\text{g}$ . The preparation of the aqueous solution was two-thirds toothpaste and one-third distilled water, except in the case of tooth powders and sodium bicarbonate. The five toothpastes in solution were placed in the five compartments and brushed simultaneously. The force applied was 55 g at a speed of 52 mvts/min. The blocks were then washed, dried, and placed in the desiccator for 48 hours. The brushes were changed after each experiment. The relative abrasion was calculated by establishing the ratio of the weight lost by the specimen over its initial weight  $\times 100$ . The results for 60 toothpastes were categorized into four abrasion levels: very abrasive (2 and over), abrasive (1.37 to 1.99), moderately abrasive (0.88 to 1.36), and not very abrasive (0 to 0.87). A special section presents "natural" toothpastes (Désautels and Labrèche's terminology).

The American Dental Association<sup>26,27</sup> proposes using RDA (radioactive dentin abrasion) and REA (radioactive enamel abrasion) values to verify the abrasiveness of toothpastes. The methodology prescribes the use of a radioactive solution composed of 10 g of calcium pyrophosphate and 50 ml of 5% carboxymethyl cellulose. The number of movements is 1500 brushings on human enamel or dentin. Blocks of PMMA are also used in *in vitro* studies. A number of manufacturers follow the ADA recommendations and this information is included on the tubes of several European brands.<sup>2,22</sup> The cost of the equipment is very high.

The protocol followed by the Comité dentifrice and summarized below was directed by a doctorate in chemistry. The tube of toothpaste used was new, and only the first portion of the tube was used in the testing. In some cases, the toothpaste varied in terms of colour and oil separation from the toothpaste as a whole. We verified several toothpastes with two identical tubes or with a sample taken from the centre of the tube. In each case, we noticed some variance in the results. Thus toothpastes do not seem

to be homogeneous, either from one tube to another or even within a single tube. It would be interesting to find out how toothpastes are manufactured, but that was not the goal of this study. In all cases, the protocol was applied rigorously, and only the first part of the tubes was used. Moreover, the seven brushes were changed before each use.

The protocol for the study of toothpaste abrasiveness and other characteristics was as follows:

1. Wash the blocks of PMMA and place them in the desiccator for a minimum of 48 hours. Weigh the blocks.
2. Prepare the solution of 50% toothpaste and 50% water (25,000 g  $\pm$  0.001 g each). Measure the height of the mixture twice. Stir on the magnetic plate for five minutes. Measure the height of the foam and compare. Note: The qualitative measurement was done with a ruler as we did not have a very accurately graduated 250-ml beaker. Measure twice.
3. Carry out the viscosity test twice by pumping 10 ml into a serological pipette and measuring the flow in 10 seconds.
4. Carry out the pH test twice by standardizing the pH meter and immersing the electrode in 3 ml of solution.
5. Verify the shape of the particles. Take two microscope photographs (optional).
6. Carry out the abrasiveness tests by preparing seven blocks of PMMA. Pour 20 ml of solution into two compartments and fill one compartment with water (control). Thus, two samples each of three toothpastes are tested simultaneously. Insert the new brushes and adjust the apparatus and the stopwatch to ensure that the test lasts for four hours.
7. Start and stop the brushing according to uniform parameters of speed, weight, and duration.
8. Take a sample of the toothpaste used. Observe the shape of the particles after the tests. Take two microscope photographs (optional).
9. Wash the blocks of PMMA and place them in the desiccator for a minimum of 48 hours. Weigh the resin blocks.
10. Remove the brushes and clean the equipment.

The protocol for the insoluble materials test comprised the following steps: place the filter in the desiccator for a minimum of 48 hours, prepare the assembly in a vacuum; mix 2 g  $\pm$  0.001 of toothpaste and 10 g  $\pm$  0.001 of water and stir in the vortex for 3 minutes (same duration as the brushing); transfer to the filter placed in the Büchner funnel. Then add 5 g  $\pm$  0.001 of water and repeat three times, also stirring in the vortex. Filter—which may take from several seconds to 12 hours, with the average time being about 30 minutes—to allow the mixture to flow through completely. Finally, put the filter back in the desiccator and weigh after 48 hours.

The protocols were applied using the equipment described below.

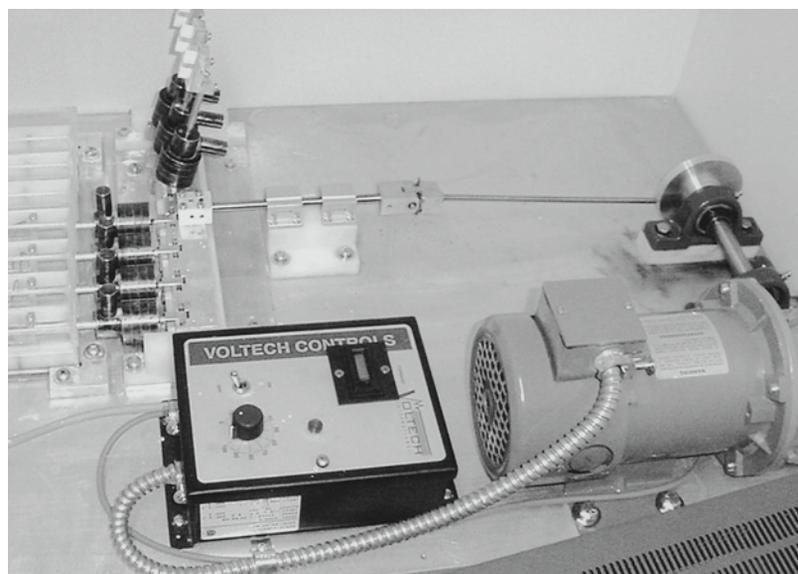


Figure 1: Brushing machine for the abrasiveness test

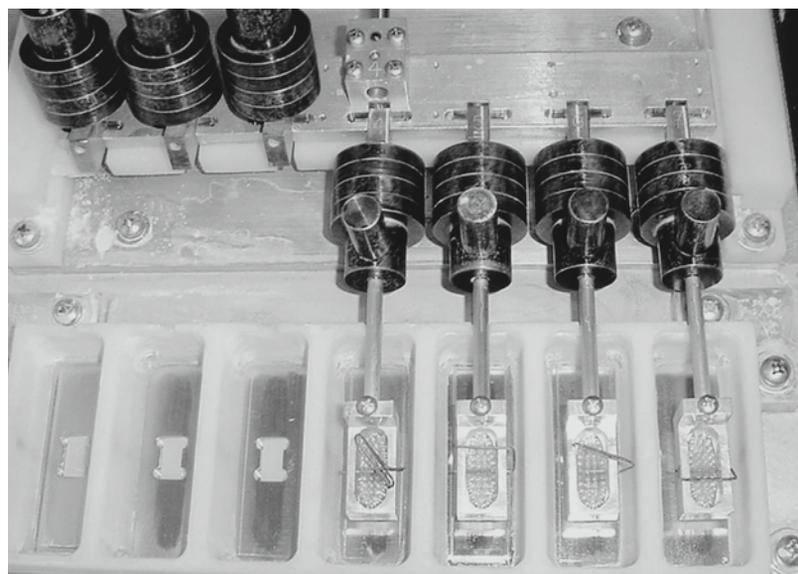


Figure 2: Brushing pan

### 3.3 Equipment

The brushing machine and the toothbrushes without handles were designed and produced at Collège FXG, and the blocks of PMMA were cut there. Most of the equipment was lent by various departments of the college. The following table (table 2) lists the equipment and notes both the supplier and features.

Finally, the statistical processing was done with Microsoft Excel software, 2003 version. The method used to determine abrasiveness was the same as that used by Désautels and Labrèche<sup>1</sup>, that is, the ratio of the final weight loss of the block of PMMA over its initial weight  $\times$  100. For example, for a 0.842 g block that weighed 0.815 g after the abrasiveness test, the calculation would be as follows:

Product name and number	Supplier *	Features
Oral-B 40 soft brush no. 663904	Oral B	Rectangular shape and flat surface, handle cut in the physical science centre
Fisher stopwatch no. 92241896	Fisher Scientific	Precision: 0.1 second
10-ml serological pipette	Mohr	Graduation: 0.1 to the end
250-ml beaker no. 1003	Pyrex	Wide, flat shape
15-ml centrifuge tube no. 3103 0015	Nalgene	Graduation: 0.1
Fisher liquid soap no. 04342	Fisher	Concentrate that leaves no residue
Vortex stirrer no. K-500-2	Sc. Industries	Three stirrers used simultaneously
Stirring hot plate no. PC 351	Corning	Set to maximum power
Octagonal stir bar no. 11451170	Fisher Scientific	Length of 51 mm
Electronic scales no. 10108379	Dewer	Max.: 200 g, precision: 0.001 g
Fisher pH-meter no. 00934	Fisher Scientific	Three calibrations, adjusted to seven
Buffer solution, pH = 7 no. SB108B	Fisher Scientific	Electrode kept in neutral solution
Scott Light Work paper tissues no. 02930	Fisher Scientific	Fine fibres that do not damage surfaces
Desiccator no. 08-644	Fisher Scientific	Drying at room temperature
Anhydrous calcium chloride no. CP-0108	Lab Mat	Drying product used in the desiccator
250-ml Erlenmeyer flask no. 10-040F	Pyrex	Vacuum assembly
Black seal plug no. 273836B8	Fisher Scientific	Adaptation between Erlenmeyer and funnel
Fisher tube no. 14-150-2K	Fisher Scientific	Installed between plug and faucet
2-clamp support for Erlenmeyer no. 05-769-3	Fisher Scientific	Fixed the assembly on the faucet
Coors Büchner funnel no. 60240	Fisher Scientific	Flat perforated bottom to hold filter and solution
Whatman Glass microfibre quantitative filter no. 1827 055	Fisher Scientific	High-performance glass fibre filter to hold all kinds of materials
Premium finest glass slide no. 12-544-2	Fisher Scientific	Observation with phase contrast microscope
Premium finest coverglass no. 12-548-B	Fisher Scientific	Observation with phase contrast microscope
Carl Zeiss West Germany phase contrast microscope, standard 14	Opti-Ressources	Maximum enlargement: 400×
JVC monitor no. TM-1400U	Opti-Ressources	Screen approximately 40 cm
Nikon CoolPix digital camera 5400	Opti-Ressources	Black-and-white setting
Pechiney Parafilm plastic packaging no. 992	Pechiney	Protector on containers
Distilled water	-	Distilled water machine in biology department
Wash bottle no. 0340922C	Fisher Scientific	Flexible plastic and fine pipette
Brushing machine	FXG	Designed and machined in physical science demonstration centre
18 X 9 X 5-mm PMMA blocks (heat-cured polymethylmethacrylate)	Johnston Industrial Plastics	Cut in physical science centre
Accessories: cylinders, cylinder stand, spatulas, pan, filter paper plate and clip, test-tube tape, fine brush for cylinders, brush to clean brushing pan, extension cord, pencils, rulers, etc.	Fisher Scientific for laboratory items, Rona Hardware and Bureau en Gros	Useful complementary items with no direct influence on tests
Computer, software and in-house compilation charts	IBM and Microsoft 2003	None

\* Contact the authors for more information on equipment, such as supplier contact information.

**Table 2.** List of equipment, suppliers and certain features

$$\frac{\text{Initial mass of the block of PMMA} - \text{Final mass of the block of PMMA}}{\text{Initial mass of the block of PMMA}} \times 100\%$$

In our example:

$$\frac{0.842 - 0.815}{0.842} \times 100 = \frac{0.027}{0.842} \times 100 = 3.2$$

The abrasiveness is expressed as a percentage, but in practice, one would tend to use the numerical value 3.2 for this toothpaste. The test is done on two different blocks simultaneously. The mean for the two tests is multiplied by 100 and constitutes the final result.

The rate of insoluble materials is determined by multiplying the difference between the final mass of the filter and its initial mass by 100. This test was only done once, since it requires a lot of time during the filtration phase. Although it was generally limited to 30 minutes, it could take more than 12 hours in the case of certain mixtures.

Foaming power is a qualitative measurement. During these tests, the 250-ml beaker contained 25 g of toothpaste and 25 g of distilled water, the initial mixture. Mixing was done on a magnetic plate for five minutes. The final mixture was homogeneous, but its volume was generally greater. The first measurement is the minimum height and the second the maximum height. For example, some toothpastes produce a huge 20-mm bubble. The mean for the two tests was calculated. The difference between the initial mixture and the final mixture provides the measurement of foaming power. Since the beaker was not finely graduated, we used a millimetre ruler and repeat the measurement twice. The mean for the two tests constituted the final result.

The calculation of the flow rate of a toothpaste was done as follows: Mean of the initial volume of 10 ml of solution at time 0 and the flow volume after 10 seconds. The higher the measurement, the faster the mixture flows. For example, the mean of an initial volume of 10 ml and a final volume of 8 ml is 9 ml. The final result is the mean of the two tests.

The pH was calculated by means of a direct reading with a pH-meter, for example, 7.14 and 7.15. The measurement was taken twice and the mean constituted the final result.

In order to determine the active agents, among other things, we noted the ingredients of the toothpastes. We should point out that there are major differences between the ingredients detected and those listed on the packaging. In fact, manufacturers are not required by law to provide a complete list of ingredients. Thus the list came from the packaging or was derived from our actual observations concerning, for example, colour. In a future project, the list of ingredients should be analyzed in more detail.

In general, the data were entered into an Excel spreadsheet for each series of tests. To ensure accurate results, double data entry was done by a third-party committee member.

The descriptive data resulting from a compilation of the tests and including frequencies, means, and percentages, are provided in the results section. In addition, general data were obtained by reading the information provided on the packaging by the manufacturers, such as anti-caries or anti-tartar action. As well, the products were observed directly, for example, concerning colour and flavour, since people may choose a toothpaste based on these criteria. However, information on market trends was not available.

The next section presents partial results for the toothpastes. It should be emphasized that, since the complete results are very lengthy, they will be covered in a second phase of the project that will include, among other things, the production of new teaching tools and a comparative chart.

#### 4. RESULTS

Partial results for approximately 200 products are presented in two major sections: general data and detailed specific data. In general, the first section indicates the manufacturers and the characteristics provided primarily by them, such as colour, flavour, texture, format, and specific action of the toothpastes. The second section with specific data presents some results on abrasiveness, pH, insoluble materials, foaming power and flow, and compares certain dental products. Of the 196 products assessed, 98% are available on the market, and 2% come from home recipes such as the mixture of bicarbonate and peroxide, which is regularly used in gentle periodontal care. For comparative purposes, a gentle prophylaxis product, a whitening product, and a product designed for denture maintenance, as well as cleansing gels for the tongue and Brush-Ups teeth wipes, were also checked. Some American and European toothpastes were tested since they are readily found on the Canadian market.

##### 4.1 General data

###### 4.1.1 Toothpaste manufacturers

Described with the term "other," 51% of manufacturers offer a small number of toothpastes. The major market share belongs to three big multinationals: Colgate-Palmolive (13%), Procter & Gamble (13%) and GlaxoSmithKline (10%). See table 3.

Manufacturers	Number	Percentage
Colgate-Palmolive Canada	26	13%
Procter & Gamble Inc.	26	13%
GlaxoSmithKline	19	10%
Church & Dwight Co. Inc.	11	6%
Oral-B	7	4%
Omni Oral Pharmaceuticals	5	3%
Zooth	3	2%
Others	99	51%

Table 3: Toothpaste manufacturers

Colour	Flavour	Texture	Format	Specific action
White: 39%	Mint: 63%	Paste: 51%	Tube: 82%	Anti-caries: 76%
Blue: 21%	Other: 22%	Gel: 29%	Bottle: 12%	Whitening: 42%
Green: 15%	Fruit: 6%	Liquid gel: 9%	Other: 6%	Anti-tartar: 26%
2–3 colours: 12%	Gum: 5%	Gel and paste: 6%		Anti-gingivitis: 21%
Clear: 7%	Cinnamon: 4%	Other: 5%		Sensitivity: 12%
Red: 7%	Citrus: 1%	Liquid: 1%		Multicare: 1%
Pink: 6%				
Orange: 3%				

**Table 4.** Breakdown of toothpastes according to colour, flavour, texture, format, and specific action

	Very abrasive: 2 or more	Abrasive: 1.37 to 1.99	Moderately abrasive: 0.88 to 1.36	Not very abrasive: 0 to 0.87
Frequency and % (n = 196)	48; 24.5%	38; 19.4%	40; 20.4%	70; 35.7%
Example	Healthy Mouth Tea Tree at 5.17	Arm & Hammer 3 Hour Fresh Breath at 2.38	Crest Whitening Expressions, mint at 2.17	Sensodyne-F Revitalizing at 0.61

**Table 5.** Abrasiveness scale

#### 4.1.2 General characteristics of toothpastes

In general, toothpaste is a white, mint-flavoured paste, available in a tube, which protects against caries or whitens the teeth. (See table 4.) The emergence of new trends is becoming evident, such as the arrival on the scene of toothpaste that is orange, that tastes like cinnamon or citrus, that is a liquid or that comes in a vertical pump, as well as toothpastes designed for diabetics.

It should be noted that the manufacturers set out the specific action of each product. Of the products available, 55 toothpastes bear the Canadian Dental Association (CDA) seal.<sup>24</sup> Of these, 45 are approved for caries, 7 for sensitive teeth, and 3 for gingivitis. An Internet search would have provided more information, but this study was limited to the information written on the package or the tube.

## 4.2 Detailed test results

Since the complete results are very lengthy, we discuss a few examples of products here and will include the detailed tables in the educational tools to be distributed later.

### 4.2.1 Abrasiveness\*

Over one-third of the toothpastes, or 35.7%, proved to be “not very abrasive” (see table 5). Approximately 75% fell below 2 on the scale, which corresponds to the hardness of dentin. Nevertheless, close to 25% are above this threshold. A few toothpastes are above 4, a level at which they could damage enamel.

\* Désautels and Labrèche<sup>1</sup> and the Comité dentifrice used the same categories, although the Comité’s methodology was adapted to take account of the numerous toothpastes on the market in 2005.

### 4.2.2 pH

Most toothpastes—more than 80%—are neutral or basic. See table 6. The acidic or highly acidic products—15% of the products tested or 30 products—are located below the critical threshold (6) for demineralization.

### 4.2.3 Insoluble materials

Insoluble materials were obtained using the vacuum assembly. Most of the toothpastes contained either between 30% and 40% insoluble material or less than 10%. (See table 7.) The pH of toothpastes with few insoluble materials and low abrasiveness is generally neutral or acidic. For example, Gel-Kam Fruit and Berry has 0% insoluble materials, 0% abrasiveness, and a pH of 3.6.

### 4.2.4 Foaming power

Approximately 50% of the toothpastes, or 97 products, do not produce much foam (see table 8). Non-foaming toothpastes are particularly appreciated in cases of dry mouth or when using an electric toothbrush.

### 4.2.5 Flow rate

In general, the flow rate for toothpastes is moderate, or approximately five drops per second. (See table 9.) The more insoluble materials a toothpaste contains, the more slowly it flows. For example, Sea Fresh, which contains 55.35% insoluble materials, flows at a rate of 0.5 ml in 10 seconds. In this test, water, which flows at a rate of 10 ml in 10 seconds, is the reference substance.

For information purposes only, the graph in figure 3 shows the distribution of insoluble materials based on the four levels on the abrasiveness scale. Additional statistical analyses would provide more detailed information. In general, the more insoluble materials a toothpaste contains,

	<b>Basic or alkaline: 8 and over</b>	<b>Neutral: 7 (7 ± 1 is considered as neutral)</b>	<b>Acidic: 4 to 5.9</b>	<b>Highly acidic: less than 4</b>
Frequency and % (n = 194)*	56; 28.9%	108; 55.7%	20; 10.3%	10; 5.1%
Example	Tom's of Maine with propolis at 9.86	Colgate Total, Advanced Fresh at 7.02	Biotene gel at 5.60	Omnii Gel, natural at 3.17

**Table 6.** pH measurements

\* Brush-Ups and bicarbonate were excluded from this test.

	<b>High: 40 or more</b>	<b>Medium: 20 to 39.99</b>	<b>Low: 0 to 19.99</b>
Frequency and % (n = 194)*	27; 13.8%	85; 43.8%	82; 42.3%
Example	Nutrismile C pure with Citrus and Spice at 56.45%	Weleda calendula toothpaste at 27.95%	Prim'age 2–6 years, fluoride 500 ppm, calcium and provitamin B5, strawberry flavour at 16.65%

**Table 7.** Insoluble materials

\* Brush-Ups and bicarbonate were excluded from this test.

	<b>High: 2 or more</b> Values representing double the initial volume or more	<b>Moderate: 1 to 1.99</b> Values moderately greater than the initial volume	<b>Low: 0 to 0.99</b> Values equivalent to or slightly greater than the initial volume
Frequency and % (n = 194)*	18; 9.2%	79; 40.3%	97; 49.5%
Example	Aim Fluoride at 2.50	GUM, Whitening Plus at 1.85	Emoform-F at 0.6

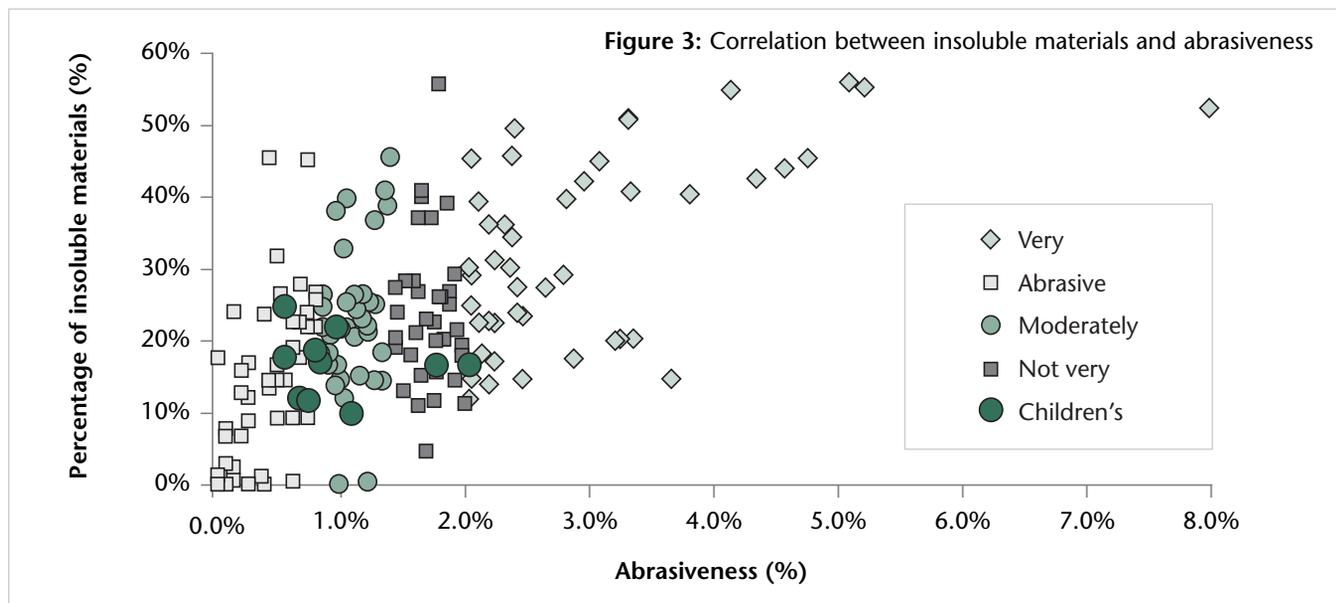
**Table 8.** Foaming power

\* Brush-Ups and bicarbonate were excluded from this test.

	<b>Fast: 7 or more</b>	<b>Moderate: 5 ± 2</b> Values between 3 and 6.9	<b>Slow: 0 to 2.9</b>
Frequency and % (n = 194)*	32; 16.5%	88; 45.4%	74; 38.1%
Example	Thera Breath, oxygenating toothpaste with aloe vera and OXYD-8, at 7.8	Colgate Icy Blast, 2 in 1, toothpaste and mouthwash, at 6.65	Crest Vivid White at 0.25

**Table 9.** Flow rate

\* Brush-Ups and bicarbonate were excluded from this test.



Products	Abrasiveness (%)	Insoluble materials (%)	Foaming power (mm)	Flow (ml)	pH
Nupro prophylactic paste, fine	7.94	52.85	0	8.1	9.36
Polident denture paste	0.42	45.68	1.7	2.85	7.69
Ban-A-Stain denture cleaner	0	0.15	0.55	2.6	1.8
Plus+White whitening gel, 5-min. whitening	0	0	1.2	2.25	6.325
Brush-Ups mint teeth wipes	0	-	0	-	-
Breath-So-Fresh tongue cleaner	0.42	13.45	0.1	1.65	5.29
GUM, Fresh-R tongue cleaner	0.73	9.4	0.15	7.9	6.46
Gel-Kam Fruit and Berry oral care rinse	0	0	0	8.25	3.6
Gel-Kam Mint oral care rinse	0.24	0	0.55	7.55	3.2
Sensodyne-F Revitalizing, tube 1	0.85	21.95	0.25	4.25	8.3
Sensodyne-F Revitalizing, tube 2	0.61	22.7	0	4.35	8.315
Mentadent, beginning of tube	2	12.05	1	5.6	8.08
Mentadent, middle of tube	1.97	11.4	1.5	2.75	8.05
Water	0	0	0	10	6.9
USP hydrogen peroxide 3%/10 vol.	0	0	0	10	4.92
USP glycerine	0.06	0	0	0.6	7.87
Glycerine and 3% peroxide	0.06	0	0.2	9.15	6.19
Arm & Hammer, Cow Brand bicarbonate of soda, dry	0.98	0	-	0	-
Bicarbonate and water 1:1	0.06	0	0	9.45	8.4
Bicarbonate and water and peroxide 1:1:1	0.36	1	0	10	8.24
Bicarbonate and peroxide 1:1	0	0	0	10	8.34
Bicarbonate and glycerine 1:1	0.12	24.05	0	10	8.32
Bicarbonate and glycerine (Désautels and Labrèche) 0.8:1	0.36	0	0	10	7.76

**Table 10.** Comparison of dental care products

the greater the probability that it will fall into the “very abrasive” category. For example, Healthy Mouth, Tea Tree (abrasiveness of 5.17%) is high, with 55.90% insoluble materials. Children’s toothpastes are not very abrasive and contain between 10% and 30% insoluble materials. They are generally gentle and neutral, such as Kidz Pre Step, with 8.90% insoluble materials, abrasiveness of 0.24% and pH of 6.78.

#### 4.2.6 Comparison of dental care products

Certain products are compared for informative purposes: a prophylactic toothpaste, whitening product, denture products, tongue cleaners, and the Brush-Ups “finger-tip toothbrush.” Comparisons were also done with two identical tubes or two tubes from which samples were taken from the beginning and middle of the tube. In addition, this section presents the results of the tests done on some very popular homemade recipes and pure products (see table 10).

The comparison of the commercial toothpastes, some home toothpastes, and other dental products made it possible to evaluate these products in relation to each other. According to this comparison, no toothpaste is more abrasive than Nupro fine prophylactic paste, which is at 7.94 on the abrasiveness scale and is very alkaline. The denture paste, which has a low flow rate, stands out because of its gentleness, an abrasiveness of 0.42 and basic pH (7.6). Ban-A-Stain denture cleaner is very acidic (pH of 1.8). The 5-minute whitening gel is quite acidic and flows slowly. Products to clean the tongue are generally quite similar to each other but do not have the same flow. In addition, they are slightly acidic. Brush-Ups clean weakly, with an abrasiveness of 0, equivalent to that of water. However, we should point out that it was not possible to do all the tests because of this product’s characteristics. Homemade recipes are similar from various points of view, including low abrasiveness and alkaline pH, which is higher with glycerine than with peroxide. Pure products, such as water,

Very abrasive: 2% or over
Abrasive: 1.35% to 1.99%
Moderately abrasive: 0.88% to 1.36%
Not very abrasive: 0.0% to 0.87%
Children's toothpaste

AmF: amine fluoride  
MFP: sodium monofluorophosphate  
NaF: sodium fluoride  
NF: no fluoride  
SnF2: stannous fluoride  
E: antibacterial enzymes  
NMH: nicomethanol hydrofluoride  
PN: potassium nitrate  
SC: strontium chloride  
P: pyrophosphate  
T: triclosan

No.	Toothpaste	Fluoride	pH	Abrasive-ness
185	Nupro fine, prophylactic paste	NaF	9.4	7.94%
124	Jasön, Healthy Mouth, pure, natural & organic, tea tree oil, clove and cinnamon	NF	7.5	5.17%
125	Jasön, Nutrismile C, pure, natural & organic, citrus & spice	NF	7.3	5.06%
136	Nature's Gate, natural toothpaste, sodium bicarbonate, Creme de Peppermint with plants	NF	8.5	4.72%
137	Nature's Gate, natural toothpaste, sodium bicarbonate, Creme de Mint with plants	NF	8.4	4.54%
155	Pearl Drops, whitening toothpaste, mint	MFP	6.6	4.30%
126	Jasön, Sea Fresh, Deep Sea, pure, natural and organic, mint	NF	6.8	4.11%
113	Green Apple Natural Toothpaste with calcium and vitamin C	NF	8.5	3.78%
170	CleanicDent, stain removal	NaF	7.3	3.64%
41	Colgate MaxFresh, with Mini Breath Strips, Whitening, Clean Mint	NaF	7.2	3.33%
112	Zesty Orange Natural Toothpaste with calcium and vitamin C	NF	8.1	3.30%
119	Tom's of Maine, natural toothpaste with propolis and myrrh, fennel	NF	9.6	3.29%
117	Tom's of Maine, natural toothpaste with propolis and myrrh, spearmint	NF	9.9	3.27%
40	Colgate MaxFresh, with Mini Breath Strips, Whitening, Cool Mint	NaF	7.2	3.22%
116	Homeodent 2, plants and chlorophyll	MFP + NaF	6.7	3.18%
134	Auomere, herbal toothpaste, Original Licorice	NF	8.6	3.05%
111	Frosty Mint Natural Toothpaste with calcium and vitamin C	NF	8.2	2.93%
74	Close-Up, mint gel	MFP	6.4	2.85%
45	Colgate Herbal White, mint, lemon extracts	MFP	10	2.77%
109	Aquafresh Triple Protection, Advanced Freshness	MFP	8.4	2.76%
49	Aquafresh Triple Protection, children's, Bubblemint	MFP	8.4	2.61%

Table 11: Summary table: Very abrasive toothpastes

Abrasive des dentifrices 2004-2006

peroxide, and glycerine, have no abrasiveness, no insoluble materials, no foam, and a fast flow (from 9 to 10). Their differences relate to pH: neutral for water, alkaline for glycerine (7.87), and acidic for peroxide (4.92).

The last table (table 11) summarizes the results of some tests on toothpastes.

It should be noted that several so-called natural toothpastes fall into this category. In general, they contain plant extracts and abrasives that are not very soluble in water, such as chalk, which influence their abrasiveness. On the other hand, since they contain several fluorine derivatives, they prevent caries and the formation of tartar. Finally,

their pH is generally neutral or basic.

To sum up, the results of this study of toothpastes done in 2005 provide new data on abrasiveness, pH, insoluble materials, flow, and foaming power, among other things. The most relevant data are analyzed below.

### 5. ANALYSIS

The following analysis allows us to scrutinize the results and make recommendations. Ideally, toothpastes should protect teeth and not present a risk. Certain toothpastes, with an acidic pH (5.5 or less), favour demineralization but have low abrasiveness. It should be noted that, although

certain bacteria are vulnerable to these variations, others are highly resistant, such as streptococci, and remain active in acidic environments.<sup>5</sup> Thus these toothpastes should be recommended with caution when roots are exposed or in case of demineralization. Alkaline or basic toothpastes may be influenced by bicarbonate of soda, which has been recommended for centuries for its alkaline effect.<sup>8</sup> During tests, solutions of water and bicarbonate (1:1) had a pH of 8.4. According to Lehne and Winston,<sup>9</sup> factors other than hardness influence a product's overall abrasiveness, such as its composition and the size and shape of the particles it contains. In fact, the relatively high solubility of bicarbonate may contribute to its low abrasiveness.<sup>9</sup> Used dry, bicarbonate of soda could wear down dentin or enamel. It did in fact scratch the block of PMMA, which gives it a moderate abrasiveness level of 0.98. On the Mohs scale, sodium bicarbonate has a hardness similar to dentin (2), but its particles are very irregular. That is the very good reason why certain toothpastes contain micronized particles.

In 1994, Désautels and Labrèche<sup>1</sup> noted the arrival of whitening agents, which now have a market share of 42%. It would be desirable if the terminology related to whitening could be standardized in the area of health. For example, pharmacists Than and Laviolette<sup>28</sup> suggest two categories of tooth whitening products: whitening agents such as WhiteStrips bands, which contain hydrogen peroxide, and toothpastes with whitening properties, which contain abrasives. The authors include recent abrasives such as aluminum trihydrate. The process of bleaching with peroxide seems to target tooth demineralization in order to replace calcium and phosphate ions with ions from fluoride or saliva.<sup>22</sup> In general, natural toothpastes and whitening toothpastes seem to be more abrasive than the others. Natural toothpastes often contain plant matter<sup>29</sup> that does not dissolve in water. Whitening toothpastes may contain very abrasive particles, such as alumina,<sup>9</sup> that may have a direct effect on surface wear. On the Mohs scale,<sup>18</sup> this metallic derivative is very hard and not soluble. Thus, caution is required when it comes to whitening agents.

It is unfortunate that North American manufacturers do not indicate the pH on their packaging, as is often done in Europe.<sup>19</sup> The RDA<sup>26,27</sup> is indicated on many European toothpastes<sup>2</sup> and it would be interesting to include it on products intended for other markets as well. Manufacturers are not required to provide a list of ingredients. However, such a list would contribute valuable information in light of the numerous chemicals available. A number of natural toothpastes go in the opposite direction by specifying the protective role of their ingredients, for example, vitamin C, which promotes gum healing.

With regard to commercial toothpastes, samples taken from two different tubes or from the beginning and middle of a single tube provided slightly different data. One sometimes finds air bubbles and changes in colour. Although it is possible that the equipment used to mix the solutions influenced the results, the human variable is unlikely to have contributed to these variations since a single person carried out all the tests. Thus, the probability

that toothpaste is homogeneous throughout the tube is low. It should be noted that the two blocks of PMMA per mix did not always give the same results, even when the mix came from the same solution. Viewed microscopically, the blocks did not display identical wear. This comparison clearly indicates that the product is not uniform. Thus, the results must be put in perspective, as they are only valid for the quantities analyzed. This finding applies to all studies on this subject. Moreover, it should be emphasized that two tests are not sufficient to generalize the results. However, since Désautels and Labrèche<sup>1</sup> did just one test per product, this study's results are more detailed, despite their limitations.

Several studies are now attempting to measure the effectiveness of therapeutic agents containing xylitol-fluoride,<sup>30</sup> triclosan,<sup>31</sup> chlorhexidine,<sup>32</sup> or amine fluorides and stannous fluoride,<sup>33</sup> which are supposed to prevent plaque and gingivitis,<sup>34</sup> or herbal toothpastes that are also said to prevent these problems.<sup>29</sup> Olive oil might even inhibit dental plaque when it is included in toothpaste.<sup>35</sup> Brushing with or without toothpaste has no effect on gum recession according to a very recent study by Versteeg et al.,<sup>36</sup> but it should be noted that they studied a very limited number of toothpastes. Nevertheless, the choice of a manual or electric brush can influence abrasion.<sup>5,37</sup> On the other hand, in Europe, the characteristics of toothpastes (such as acidity), cleansing power, and the analysis of abrasives (for example, hydrated silica, calcium carbonate, and aluminum trihydrate)<sup>2</sup> have been studied for some years now. Saliva also plays a key role in the accumulation of plaque and the demineralization of enamel.<sup>38</sup> Other research results have revealed new antimicrobial agents that are effective to varying degrees against micro-organisms.<sup>39</sup> More than 500 types of micro-organisms, including bacteria, fungi, and sometimes amoebae, form a complex and dynamic community within the biofilm.<sup>40</sup> Thus, research into biofilm will reveal other aspects that will undoubtedly be taken into consideration in basic and clinical research.<sup>41</sup> These studies are even more detailed than before and they open up new perspectives in dental health. The new products related to the user's general state of health, such as the products designed for diabetics and the toothpastes that target specific kinds of oral health problems, are likely to increase since they meet the specific needs of the aging population.

The methodology and protocol were quite time-consuming, but they were necessary to produce the main observations of the members of the interdisciplinary team. The involvement of professionals with different backgrounds was important in the design and execution of the study and constitutes an asset. The analysis could be even more detailed, but this overview gives one an idea of the toothpastes appropriate for each customer's specific needs.

## 6. RECOMMENDATIONS AND SPINOFFS

This study has generated many spinoffs for the instructors and departments at Collège FXG who worked together in an interdisciplinary fashion. Before the study, instructors in the dental hygiene department deplored our lack of

knowledge of toothpastes, and the entire department is proud to have contributed to advancing the profession. We should emphasize that this project was modest, simple, and relatively easy to implement. A subsequent update is possible at the College because much of the equipment is long-lasting and remains available to instructors. This valuable partnership provided the momentum needed to increase synergy within the whole department.

We anticipate circulating the results by means of a brochure, teaching materials, or lectures, in both French and English. Thus, it would be desirable to undertake a second phase, which would involve seeking out partners to disseminate the results of the study, for example. This kind of dissemination would be valuable for instructors, students, and professionals. In addition, with time, consumers would become better informed about the products available on the market and would therefore benefit from the spinoffs of such a study. We must point out that the dissemination of all the results must be approved by the dental hygiene techniques department at Collège FXG.

As for the limitations on the study, we should mention that the methodology and the manufacture of the brushing machine were very time-consuming. The information needed to reproduce the brushing machine can be obtained by applying to the plan designers. On the other hand, the same protocol could be used to include new toothpastes. The results are presented as percentages, but the ideal would be to determine the equivalency between the abrasiveness rate and RDA or REA. The latter measures are used by manufacturers and appear on the packaging of many European toothpastes. Certain information ought to be mandatory, for example, a list of ingredients, abrasiveness, pH, and insoluble materials. These variables should be considered when oral health professionals are advising their clients. On the other hand, it would be interesting to examine materials other than PMMA, since hundreds of products have come onto the market since 1964, when the primary study of materials similar to human enamel and dentin was done. To the best of our knowledge, the hardness of enamel has not been verified in children. This factor could be relevant in determining the minimum abrasiveness required to clean teeth. The maximum abrasiveness should take into consideration all of the exposed parts of the tooth, namely, the enamel (the hardest part) and the dentin (the softest part). Any other variable subject to Newton's law during brushing should also be examined in more depth, such as the force used during brushing and the choice of a manual or electric toothbrush, or even an ultrasonic one that acts on the biofilm at a distance.

Our study has made it possible to establish certain relationships between general concepts and specific concepts, while enabling us to formulate some concrete recommendations.

## 7. CONCLUSION

This study fulfilled its mandate and achieved its general objective, namely to update the available data on toothpastes. Forrest and Miller's<sup>13,14</sup> model proved to be useful

for reconciling scientific data, the point of view of professionals, customers' needs, and the constraints of the environment, such as the construction of the brushing machine in Quebec City. Moreover, the addition of new variables made it possible to examine some aspects in more depth. The formulation of the methodology was time-consuming but crucial. The statistical processing provided descriptive results, thanks to the use of means, for example. The study determined that the abrasiveness of 75% of the products was between 0 and 1.99 on the scale, which is equivalent to the hardness of dentin. The mean percentage of insoluble materials is either between 30% and 40% or lower than 10%. As for foaming power, it is low in most products. Approximately half the products flow moderately fast, at a rate of about five drops per second. When it comes to pH, the vast majority of the products are neutral, while approximately 25% are very basic and 15% acidic (pH of less than 6). The composition of cosmetic and therapeutic toothpastes was also assessed, particularly their active agents. The majority are not approved by the CDA, although they have the same concentration of products. For example, most children's toothpastes contain 0.243% NaF, but only a minority are approved by the CDA. Finally, children's toothpastes are not very or not at all abrasive, and they contain few insoluble materials in general.

Other statistical tests are necessary to discover the links between the various characteristics of toothpastes. There is a call for a second phase focusing on the dissemination of results and educational materials in French and English.

This innovative study of some 200 products meets several needs. It meets the needs of dental care professionals for more accurate information on prevention. In addition, it allows manufacturers to detect new trends—and there are many—by analyzing flavours, modifying such ingredients as humectants, or adding ingredients specifically adapted to diabetics, or vitamins and minerals such as vitamin C, calcium and copper, which have an effect on the gums, periodontal bones, or biofilm. And the general public wants to know the properties of toothpastes, such as fruit-flavoured pastes, so they can buy an appropriate product. Abrasiveness becomes a risk factor when the product is too abrasive or too acidic, for example. The toothpaste should constitute a protective factor that reduces oral and dental problems such as caries, tartar, gingivitis, and hypersensitivity. This expanded vision of dental products opens up interesting prospects for research, as well as clinical spinoffs in the short, medium, and long term.

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who provided us with services: Louise Robichaud and Maurice Robichaud for translating the abstract of a presentation to the FDI World Dental Federation into English, the instructors in dental hygiene, and the information services and secretarial services teams at Collège FXG.

A second team will now take over for phase 2, which should be equally interesting and relevant. **Requests for reprints:** contact Nadia Dubreuil, Collège FXG. Tel.: 418 688-8310. E-mail: ndubreuil2@cegep-fxg.qc.ca.

### Relationship between the project and sponsors

Funding for this study was provided by the Continuing Education Committee of the Dental Hygiene Department at Collège FXG. There is no relationship between any sponsors and the study of toothpastes. In the first phase, neutrality was preferred in order to ensure that the study was independent. The second phase will respect the same criteria with regard to the documents produced, while relying on new partnerships concerning, for example, the translation, production and dissemination of reprints and educational material.

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## Journals in Our Library...continued

by CDHA staff

AS PROMISED IN THE PREVIOUS COLUMN, WE ARE continuing the review of journal holdings in the CDHA library as well as selected electronic publications. The collection's primary focus is serving the interests and needs of our members—practising dental hygienists. A number of the publications mentioned below also introduce a broader view of societal health-related issues; for example, presenting the concerns of special interest groups in order to encourage the interdisciplinary cooperation needed to promote total wellness.

### **Journal of Dental Research**

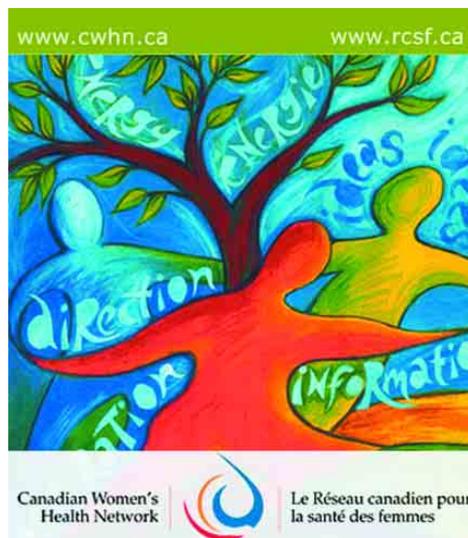
[www.dentalresearch.org/publications/jdr/index.html](http://www.dentalresearch.org/publications/jdr/index.html)

This journal is published monthly by the International and American Associations for Dental Research. The mission statement of these organizations incorporates the principles of advancement of research and knowledge for the improvement of oral health worldwide, and of facilitating the communication and application of research findings. Recent articles of interest to dental hygienists include a review of findings about "Protective and Destructive Immunity and the Periodontium" (in the March 2006 issue, Vol. 85, No. 3). The website includes extensive links and resources for professionals interested in learning more about research and evidence-based practice. Access to the journal on-line requires a subscription but individual articles may be ordered through the CDHA library.

### **Quintessence International**

[www.quintpub.com](http://www.quintpub.com)

*Quintessence International* is published 10 times a year by Quintessence Verlags-GmbH of Berlin, Germany. This journal is dedicated to "keeping the busy practitioner current with advances in all areas of dentistry" by providing reports on clinical innovations paired with outstanding illustrations. Recent articles of interest to dental hygienists include a comparison of the clinical efficacy and safety of carbamide and hydrogen peroxide in at-home bleaching gels, and a systematic review of the effectiveness of rinsing with chlorhexidine gluconate after brushing and flossing teeth. There are also many articles of particular interest to restorative dental hygienists. Again, on-line access is limited to subscribers but you can get issues' table of contents and abstracts of articles from 1991 to the present. There are also some interesting free, full-text articles on the website under the tab "Current Topics," for example, "The Hopeless Tooth: When Is Treatment Futile?"



### **Contemporary Oral Hygiene**

[www.contemporaryoralhygieneonline.com](http://www.contemporaryoralhygieneonline.com)

This journal is published monthly by Ascend Media and each issue reaches over 60,000 dental hygienists. The mission of this peer-reviewed journal is to emphasize the importance of the profession by focusing on the critical role of the dental hygienist in delivering both clinical oral care and patient education. Each issue features one clinical continuing education article and accompanying quiz. In July 2006, the CE article was "Oral Pretreatment Protocol for Patients Undergoing Oral Cancer Therapy." Unfortunately, at this time, free subscriptions are available only in the United States.

### **Dimensions of Dental Hygiene**

[www.dimensionsofdentalhygiene.com](http://www.dimensionsofdentalhygiene.com)

This journal is a peer-reviewed, monthly publication by Belmont Publications. Produced and edited by dental hygienists, this journal attempts to reconnect the practising hygienist with leading academics and researchers. Each issue offers a wide range of topics—ranging from the very practical such as anticariogenic agents to cutting-edge issues such as facial esthetic procedures. Regular features are columns on women's health and the latest dental products. The October 2006 issue had an article on "A Modern Approach to Periodontal Debridement," discussing blended instrumentation techniques. This journal is available electronically to all dental hygienists and also offers access to an on-line discussion forum.

**Canadian Women's Health Network**

Journals in Our Library ...continued on page 58

## Sunstar Americas Completes Corporate Identity Transition from Sunstar Butler to Sunstar

**Guelph (November 7, 2006)** – Sunstar Americas, Inc. announces the completion of its corporate identity transition from Sunstar Butler to Sunstar. The company, founded in 1923 as John O. Butler, became part of the Sunstar family in 1988 and had changed its corporate identity to Sunstar Butler in 2003. The change to Sunstar will allow all regions of Sunstar (the Americas, Europe, Japan and Asia) to operate under a globally-unified corporate identity.

The change in corporate identity is a positive reflection of Sunstar's rapid global growth. The name change also reflects Sunstar's dramatic increase in new product innovation, said Dan Descary, Vice President, General Manager - Sunstar Americas, Inc. "Since becoming part of Sunstar, the company has introduced a significantly expanded line of innovative preventative care, hygiene supply, pain management, and clinical products. We have grown and changed, and our new corporate identity reflects our global strength and broader product offerings."

Despite the corporate name change, Sunstar will maintain the names of its iconic product brands. "We are not changing the Butler® and GUM® brand names, which have a strong heritage, especially among dental professionals," explained Dan Descary.

### About Sunstar

Sunstar is a company founded in Japan with worldwide sales of over \$1 billion. Sunstar has offices in 15 countries and four major geographic divisions including Sunstar Americas, Inc., which serves North and South America. Sunstar continues their global partnership with dentistry to develop a better understanding of the potential links between oral health, general health, and quality of life. The GUM® brand of products manufactured by Sunstar have been trusted and recommended by dental professionals for over 80 years. The company's products are designed in consultation with dental professionals and are manufactured to the highest quality standards, assuring product excellence and patient satisfaction.

**For more information, please visit [www.SunstarAmericas.com](http://www.SunstarAmericas.com).**

### Journals in Our Library (continued from page 57)

[www.cwhn.ca](http://www.cwhn.ca)

Network/ leRéseau is published in English and French four times a year by the Canadian Women's Health Network (CWHN). CWHN was established in 1993 to improve the health and lives of girls and women in Canada and the world through sharing of resources, knowledge and ideas. The network is guided by a women-centred vision of health and wellness and believes that social and economic issues must be addressed to impact the health status of women. Two recent articles of interest to health care providers are "Information, NOT Advertising: Women and Pharmaceuticals," and "Who Counts as a Health care Worker," a review of the report *Critical to Care: Women and Ancillary Work in Health Care* (available at [www.yorku.ca/nnewh/index\\_EN.htm](http://www.yorku.ca/nnewh/index_EN.htm)).

### **Healthcare Management FORUM**

[http://cchse.org.wedodns.com/default\\_publications.asp?active\\_page\\_id=297](http://cchse.org.wedodns.com/default_publications.asp?active_page_id=297)

The FORUM is a peer-reviewed journal published four times a year by the Canadian College of Health Care Executives. The FORUM encourages analysis of issues relating to health services theory and practice in the Canadian context. A recent article discusses the application of evidence-based health care to complementary and alternative medicine. This journal is published French and English.

We hope that you will visit several of the websites mentioned in this column. They will provide many opportunities for professional development and contact with dental hygienists and other health professionals. As CDHA president Diane Thériault mentioned in a recent President's Message, "knowledge is power" and the "time is definitely here for dental hygienists to work in multidisciplinary teams to prevent the onset of chronic diseases." 

# More on Oral-Systemic Disease Links and Thumbsucking

by CDHA staff

THIS COLUMN LOOKS AT TWO OF THE TOPICS DISCUSSED in this issue of the journal—the possible links to systemic disease of preterm low birth weight infants and respiratory disease, and thumb/pacifier sucking. The sites range from scientific reviews, to a health coalition and hospital site, to pediatric sites.

***“Exploring the relationship between periodontal disease and pregnancy complications”*** [article by YA Bobetsis, SP Barros, and S Offenbacher (J Am Dent Assoc. 2006;137(Suppl):7S-13S)]

[http://jada.ada.org/cgi/content/full/137/suppl\\_2/7S](http://jada.ada.org/cgi/content/full/137/suppl_2/7S)

A special supplement to the October 2006 issue of the *Journal of the American Dental Association* deals with “The oral-systemic disease connection.” This article looks at maternal gingivitis and periodontitis as a possible risk factor for preterm birth and other adverse pregnancy outcomes. It summarizes many case control and prospective studies published after the first report in 1996 of a potential association between maternal periodontal disease and preterm LBW babies. It states in the results that “Although there are some conflicting findings and potential problems regarding uncontrolled underlying risk factors, most of the clinical studies indicate a positive correlation between periodontal disease and preterm birth.” The complete article is available on-line.

***“Pneumonia in nonambulatory patients. The role of oral bacteria and oral hygiene”*** [article by FA Scannapieco (J Am Dent Assoc. 2006;137(Suppl):21S-25S)]

[http://jada.ada.org/cgi/content/full/137/suppl\\_2/21S](http://jada.ada.org/cgi/content/full/137/suppl_2/21S)

A second article in this supplement deals with pneumonia and the possible relationship between “poor oral health, the oral microflora and bacterial pneumonia.”

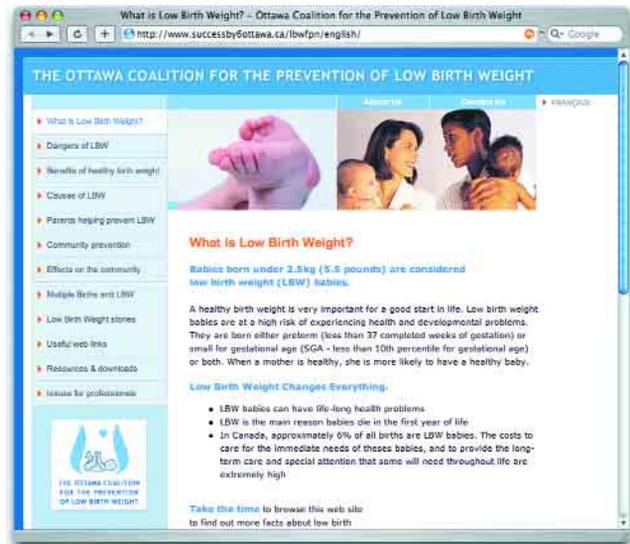
The entire contents of this supplement would be of interest to dental hygienists. Although the last 12 months of *JADA* appears to be available only to members and subscribers, the articles appear in full text through PubMed.

## **Link between Periodontal Disease and Adverse Birth**

**Outcomes** [Toronto Staff Report, February 13, 2006]

[www.toronto.ca/legdocs/2006/agendas/committees/hl/hl060227/it002.pdf](http://www.toronto.ca/legdocs/2006/agendas/committees/hl/hl060227/it002.pdf)

An interesting 8-page report from Toronto’s Medical Officer of Health to the Board of Health. The purpose of the report is “to inform the Board of Health of current findings pertaining to the potential link between periodontal disease and adverse birth outcomes with a view to identifying possible public health strategies.”



***The Ottawa Coalition for the Prevention of Low Birth Weight***  
[www.lbwinfo.ca](http://www.lbwinfo.ca)

The mission of this site is to promote “healthy births by increasing awareness of the impact of low birth weight on babies, their families and communities, the factors that contribute to low birth weight and the steps that can be taken to reduce its incidence.” It is a “a multi-sectoral coalition of agencies, health care providers, interested individuals and organizations,” including representatives from the Centretown Community Health Centre, Canadian Mothercraft, the City of Ottawa, the Children’s Hospital of Eastern Ontario, and the Ottawa Hospital. The site discusses what low birth weight is, its dangers and causes, the benefits of a healthy birth weight, community prevention, multiple births and LBW, links and resources.

***Thumb and pacifier sucking (C.S. Mott Children’s Hospital, Ann Arbor, Michigan)***

[www.med.umich.edu/1libr/pa/pa\\_thumbsuc\\_hhg.htm](http://www.med.umich.edu/1libr/pa/pa_thumbsuc_hhg.htm)  
[thumbsucking]

A page for parents on thumbsucking—what it is, what causes it, how long it lasts, how to help a child overcome it. There is also a resource page and a page on “habit reversal training.” The latter page does not seem to be accessible from the main page; you have to go to the Health Topics index page and scroll down to the “T” and click on “habit reversal training.”

[www.med.umich.edu/1libr/pa/pa\\_pacifier\\_hhg.htm](http://www.med.umich.edu/1libr/pa/pa_pacifier_hhg.htm)  
[pacifiers]

The page on pacifiers look at why a pacifier might be used, when to give it to a baby, safety precautions, and then how to get the child to stop using a pacifier.

These are interesting sites in light of the pacifier- and digit-sucking article in this issue of the journal.



## DrGreene.com

[www.drgrgreen.com/21\\_856.html](http://www.drgrgreen.com/21_856.html) [thumbsucking]

[www.drgrgreen.com/21\\_860.html](http://www.drgrgreen.com/21_860.html) [pacifiers]

This is an individual's site—the author is a pediatrician who teaches at Stanford University in Palo Alto, California, and is an attending physician at that university's children's hospital. His site gives information on a wide variety of topics of interest to parents, including pages on thumbsucking and pacifier use.

**The Wisdom Tooth on thumbsucking and pacifiers** [with cooperation from the School of Dental Hygiene at the University of Manitoba]

[www.umanitoba.ca/outreach/wisdomtooth/thumb.htm](http://www.umanitoba.ca/outreach/wisdomtooth/thumb.htm) [thumbsucking]

[www.umanitoba.ca/outreach/wisdomtooth/pacifier.htm](http://www.umanitoba.ca/outreach/wisdomtooth/pacifier.htm) [pacifiers]

These two pages give basic information about thumb and pacifier sucking.

## Dr.Spock.com

[www.drspock.com/topic/0,1504,150,00.html](http://www.drspock.com/topic/0,1504,150,00.html)

[thumbsucking]

This page links the reader to pages on why a baby sucks his/her thumb, thumbsucking in breast-fed babies and in bottle-fed babies, negative effects of the habit, when to get worried, and how to stop the habit.



[www.drspock.com/article/0,1510,3946,00.html](http://www.drspock.com/article/0,1510,3946,00.html) [pacifiers]

A site that discusses why pacifiers are used, how to use pacifiers, pacifier use in bed, replacing old pacifiers.

**Thumbsucking** [Palo Alto Medical Foundation]

[http://pamf.org/children/healthinfo/index1.cfm?section=healthinfo&page=article&sgml\\_id=hw170183](http://pamf.org/children/healthinfo/index1.cfm?section=healthinfo&page=article&sgml_id=hw170183)

Another general information page on this situation. 

## Labour Surveys and CDHA Membership (continued from page 7)

coast. By doing this, we (and you) will be able to compare the results from one jurisdiction to another. You can use this information to satisfy your curiosity or to influence change within your own organization.

This survey could be completed on paper or on-line—your choice. As you know, we ask you to comment on-line in other surveys on position papers, products, and processes so you can influence not only CDHA but also the oral health industry. We appreciate your taking the time to send in your thoughts and preferences and when possible, we like to reward those who participate. Our partnership with various companies allowed us to award a widescreen HDTV and home theatre system last year as well as fun gift certificates and various oral health care products.

These surveys and their results (plus the interesting incentives that sometimes accompany them) go to members of CDHA or are available to members through the *Members Only* section of our website ([www.cdha.ca](http://www.cdha.ca)). They are just one of the benefits of membership and I would like to highlight three other on-line benefits that come with belonging to CDHA.

Continuing education is an important part of your professional development. Whether or not there are formal CE requirements in your province, it is essential to stay up to date on the latest research, clinical procedures, and issues affecting your profession. We have on-line CE courses and offer a subscription to the *DVD Journal of Dental Hygiene* at discounted rates. As a member of CDHA, you

can take advantage of one complimentary on-line CE course in each membership year. You can also keep track of all your CE courses using the Professional Development Manager Tool, accessed through the "Continuing education" page.

As a member of CDHA, you can now shop on-line at the CDHA Boutique for such items as CDHA-branded merchandise and other items that can be purchased at a discount. In addition to the Boutique, you can also save substantially on fitness memberships, cell phones, electronics, rental cars, hotels and much more through our affinity partner program.

We also have just launched the CDHA Dental Hygiene Recognition Program to recognize the efforts and accomplishments of members, both practising dental hygienists and dental hygiene students. We are able to offer a variety of innovative prize categories through the contributions of CDHA Corporate Partners. More information is available on-line about the application process, categories, and submission guidelines.

We welcome your feedback, by e-mail, telephone, fax, or letters about our surveying you for your views of what is going on in the dental hygiene community. Take some time and explore the CDHA website, especially the section for *Members Only*. That way, you increase your connection to your fellow dental hygienists, the profession, and to your organization. 

## CLASSIFIED ADVERTISING

CDHA and *CJDH* take no responsibility for ads or their compliance with any federal or provincial/territorial legislation.

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**COMOX VALLEY** Opportunity for full-time employment in Comox Valley, Vancouver Island. Brand new clinic – the best of everything. We are growing: 6 operatories with digital and chart-less computer system. Just 3 hours north of Victoria. Reach your goals sooner and enjoy a wonderful lifestyle. Wage and hours negotiable. Qualification: Licence to practice in B.C. Please contact Dr. Jill Toews, B - 1710 Comox Ave., Comox, BC V9M 3N2. Tel: **250-339-9848**; fax: **250-339-9832**; e-mail: [accounts\\_jilltoews@telus.net](mailto:accounts_jilltoews@telus.net)

**FRASER VALLEY** Dental hygienist wanted 4 days/week to join our friendly dental team in a two-dentist practice in the Fraser valley. Only one hour from Vancouver and the ocean. An ideal place to live for the outdoor enthusiast. Affordable housing and nice place to raise a family. Please fax résumé to **604-792-0191**.

**LANGLEY** Well-established family practice with an emphasis on comprehensive dentistry requires a dental hygienist 2 days per week. Please call Lisa at **604-897-7594** or fax résumé to **604-532-8829**.

**VICTORIA** Spa-like dental hygiene clinic seeks an entrepreneurial dental hygienist to start their own independent clientele. Also holiday relief work available. It's great being in control of your own conditions. No waiting for dentist to do exam. Work in up-town shopping area. Expression of interest to: [smiles\\_4u@shaw.ca](mailto:smiles_4u@shaw.ca) or write and send to Victoria's Dental Hygiene Clinic, 108-1030 Yates Street, Victoria, BC V8V 5A7. Tel: **250-382-SMILE (7645)**; fax: **250-382-7643**, Attention: Mary Ellen Breckenridge RDH.

### NORTHWEST TERRITORIES

**YELLOWKNIFE** Adventure & Freedom! Experience the Diamond Capital of Canada! Experience working in an ultra modern facility! Great hours! Great Team! We are currently looking for a dental hygienist to complete our team! Want to know more? Check us out at [adamdentalclinic.ca](http://adamdentalclinic.ca). For more information, call **867-873-2775** or fax **867-920-2775** your résumé to Krista.

## Advertisers' Index

CE Solutions . . . . .	19
Citagenix Inc. . . . .	41
Colgate-Palmolive Canada Inc. . . . .	4
Crest Oral-B . . . . .	5, 6, 12
Dentsply Canada . . . . .	IBC
Group Retirement Services . . . . .	60
Healthstudies Institute. . . . .	29
Hu-Friedy Manufacturing Company Inc. . . . .	OBC
ISDH. . . . .	35, 36
Johnson & Johnson Inc. . . . .	11
Meloche Monnex . . . . .	45
Ondine Biopharma . . . . .	16
Sunstar . . . . .	IFC, 15, 32-33, 58

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**MEDICINE HAT** Permanent part-time dental hygienist required for a busy family practice. Starting schedule is Thursdays and Fridays 8-5, and every second Saturday 8-2, with potential to grow to 3 days per week plus every second Saturday. Contact our Office Manager, Kevin Clarkson, by telephone **403-526-7555**, fax **403-526-1119**, e-mail [Kevin.grover@shaw.ca](mailto:Kevin.grover@shaw.ca), or see our website at [www.groverdental.ca](http://www.groverdental.ca).

**STETTLER** Dental hygienist needed for state-of-the-art dental practice. Dental hygiene program for over 25 years. Family-oriented centre with strong school programs and recreational amenities; short commutes to Red Deer, Edmonton, and Calgary. Exceptional hourly wage, significant signing bonus, relocation allowance, and other incentives. We need a highly motivated team member with superior clinical and strong communication skills and a valid Alberta dental hygiene licence. Dr. James A. Casey, Box 1388, Stettler, AB T0C 2L0. Tel: **403-742-5588**; fax: **403-742-6213**; e-mail: [jcasey@electrotel.ca](mailto:jcasey@electrotel.ca).

### ONTARIO

**TORONTO** 1RDH Faculty of Dental Hygiene - a division of Canadian Business College. Instructors required to teach in theory and practice courses. Candidates must demonstrate commitment to teaching, learning, and student success. Qualifications: Registered Dental Hygienist with 2 years of recent clinical experience. Please send résumé with cover letter by e-mail to [paul.s@1rdh.com](mailto:paul.s@1rdh.com) or by fax to **416-925-9920**.

### NOVA SCOTIA

**TRURO** Victoria Court Dental is seeking a high-energy, self-motivated, and enthusiastic RDH. Hours are flexible. To further explore this opportunity, please mail, fax, or e-mail résumé, Attn: J. Verney. Address: Victoria Court Dental, 510 Prince Street, Truro, NS B2N 1G1; fax: **902-893-8913**; e-mail: [jverney@eastlink.ca](mailto:jverney@eastlink.ca). Visit our website at [www.victoriacourtdental.com](http://www.victoriacourtdental.com).

### INTERNATIONAL

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### CDHA CLASSIFIED ADS

Classified job ads appear primarily on the CDHA's website ([www.cdha.ca](http://www.cdha.ca)) in the Career Centre (*Members' Only* section). On-line advertisers may also have their ad (maximum of 70 words) listed in the journal *CJDH* for an additional \$50. If an advertiser wishes to advertise only in the print journal, the cost will be the same as an on-line ad. These classified ads reach over 11,000 CDHA members across Canada, ensuring that your message gets to the target audience promptly. Contact CDHA at [info@cdha.ca](mailto:info@cdha.ca) or **613-224-5515** for more information.



