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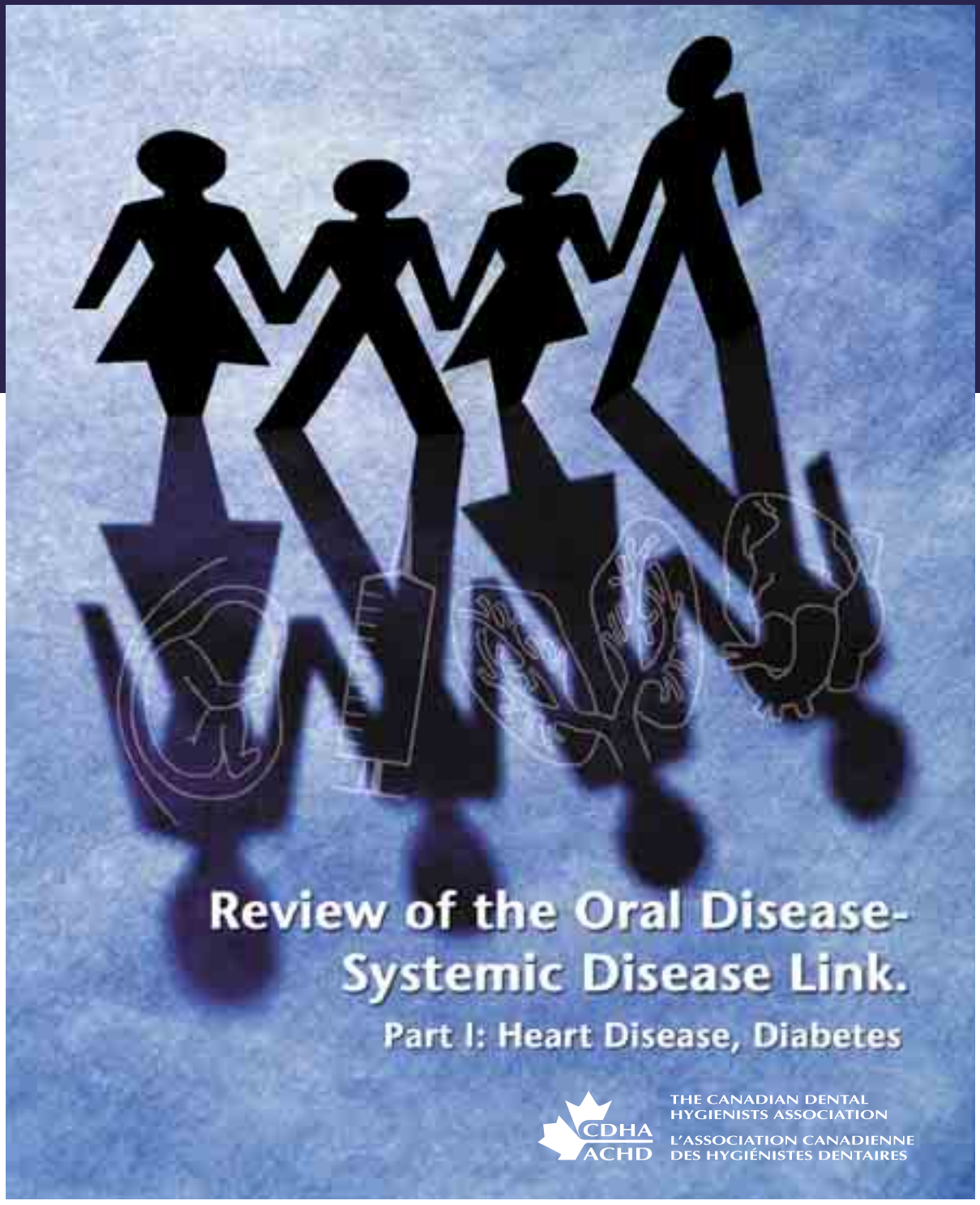

THE OFFICIAL JOURNAL OF THE CANADIAN DENTAL HYGIENISTS ASSOCIATION

Building Relationships

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

FALL IS A TIME OF NEW BEGINNINGS. AS WE say goodbye to the warm, relaxed summer days, we look forward to the challenges and opportunities that come with the changing of the seasons. I can remember as a child enjoying the preparation for a new school year and the excitement of a fresh start. As a dental hygiene educator, I reflect on the spirit with which I will approach my new school year, implementing ways to invigorate and support a healthy learning environment for my students.

This fall I began my term as your CDHA President. I am looking for ways that I can support meeting the goals of the members during this coming year. Over the past three years, as a board member representing DHEC (Dental Hygiene Educators of Canada), I have worked with dental hygienists from across Canada. I have learned a great deal about CDHA and now have a much greater appreciation for the challenges and opportunities we all face in this profession—individually, provincially, and nationally.

Dental hygiene is about relationships.

As Stephen Covey said, "Rather then focusing on things and time, focus on preserving and enhancing relationships and accomplishing results." This quote summarizes one of the main lessons I have learned from being a part of the dental hygiene profession for 38 years. Dental hygiene is about relationships; our relationships with our employers, co-workers, and clients support and structure our daily professional lives. The strength and depth of these relationships determine to a large extent how we wake up each morning: looking forward to work or looking at it as a daily grind to get through. A smile from a co-worker, a word of encouragement and appreciation from our employer, or an expression of gratitude from a client can go a long way toward making our professional life satisfying.

Stephen Covey, in his book *7 Habits of Highly Effective People*, labels the sixth habit "Synergize" or the habit of creative co-operation—the principle that the whole is greater than the sum of its parts. This principle implicitly lays down the challenge to see the good and potential in the other person's contribution. Synergy in dental hygiene practice means that the members of the dental team work

Building Relationships *…continued on page 324*

Établir des relations

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

L'AUTOMNE EST UN TEMPS DE NOUVEAUX débuts. Alors que nous disons au revoir aux journées chaudes et relaxantes, nous attendons avec impatience les défis et les possibilités qui viennent avec le changement de saison. Je peux me rappeler qu'enfant j'aimais la préparation de la nouvelle année scolaire et l'excitation d'un nouveau départ. Comme éducatrice en hygiène dentaire, je réfléchis sur l'esprit avec lequel j'aborderai ma nouvelle année scolaire, en élaborant des façons de revigorer et favoriser un environnement d'apprentissage sain pour mes étudiants et étudiantes.

L'hygiène dentaire est une question de relations.

Cet automne, j'ai commencé mon mandat comme présidente de l'ACHD. Je cherche par quels moyens je peux soutenir les objectifs des membres durant cette nouvelle année. Au cours des trois dernières, en tant que membre du conseil d'administration représentant les ÉHDC (Éducatrices en hygiène dentaire du Canada), j'ai travaillé avec des hygiénistes dentaires de partout au Canada. J'ai appris beaucoup sur l'ACHD et, maintenant, j'ai une bien meilleure compréhension des défis et des opportunités auxquels nous faisons tous et toutes face dans cette profession – individuellement, provincialement et nationalement.

Comme Stephen Covey le disait, « Au lieu de nous concentrer sur les choses et le temps, concentrons-nous sur la préservation et l'amélioration des relations ainsi que sur l'accomplissement des résultats. » Cette citation résume une des principales leçons que j'ai apprise en faisant partie de la profession de l'hygiène dentaire pendant 38 ans. L'hygiène dentaire est une question de relations ; nos relations avec nos employeurs, nos collègues et nos clients étayent et structurent nos vies professionnelles. La force et la profondeur de ces relations déterminent en grande partie comment nous nous réveillons chaque matin : en ayant hâte d'aller travailler ou en pensant que c'est une corvée quotidienne et qu'il faut passer au travers. Un sourire d'un ou d'une collègue, un mot d'encouragement et d'appréciation de notre employeur, ou une expression de gratitude d'un client peuvent nous aider à faire un long chemin vers une vie professionnelle satisfaisante.

Établir des relations *…suite page 334*

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Rewards of Challenges

by Susan Ziebarth, BSc, MHA, CHE

"The gem cannot be polished without friction, nor man perfected without trials."

– Chinese Proverb

IN THIS ISSUE, LAURA MACDONALD PROVIDES AN EXPOSITION on critical thinking and its importance in dental hygiene. With this article, Ms. MacDonald would like to promote dialogue, debate, and discourse within the dental hygiene community regarding the importance of actively using critical thinking as a competency of the dental hygienist. I found the article quite timely and relevant to recent discussions that have ensued regarding CDHA position papers.

CDHA researches topics of interest to the profession, drafts papers, and invites comments from the membership and from content experts. After the comments are received, the literature is once again consulted and decisions made whether the paper will be amended or the original text retained. We also post all of the comments received on the CDHA *Members' Only* portion of the website so that you can read what others thought of the draft and what issues were noted as being pertinent.

Research is only one component of evidence-based decision making.

With the last trilogy of papers on flossing, tooth brushing, and rinsing, we had some very interesting feedback. Some members questioned why we would even look at those issues as they are such an everyday occurrence for dental hygienists that they did not feel it was a wise use of CDHA resources to review the topics. Others questioned the research parameters regarding the literature reviews, considering them to be too narrow to fully represent a good study.

One of our members took the time to write a very compelling letter to us regarding the flossing paper. He noted the importance of asking the right questions to obtain unbiased answers. He also introduced the notion of common sense and the need for research not to be so pure as to overlook some things, which from an everyday standpoint do not add up to the whole picture. In response to the member's concerns, the author of the research paper that supports the CDHA position statement noted that

Rewards of Challenges *...continued on page 325*

Les récompenses des défis

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

« Les pierres précieuses ne peuvent être polies sans friction, pas plus que l'homme ne peut se perfectionner sans essais. »

– Proverbe chinois

DANS CE NUMÉRO, LAURA MACDONALD NOUS OFFRE un exposé sur la pensée critique et son importance en hygiène dentaire. Avec cet article, Mme MacDonald aimerait favoriser le dialogue, le débat et le discours au sein de la communauté des hygiénistes dentaires sur l'importance d'utiliser activement la pensée critique comme une compétence de l'hygiéniste dentaire. J'ai trouvé l'article assez opportun et plutôt pertinent compte tenu des discussions qui ont suivi les articles portant sur les déclarations ou prises de position de l'ACHD.

« La recherche est seulement une des composantes de la prise de décision fondée sur des éléments probants »

L'ACHD recherche des sujets d'intérêt pour la profession, des projets d'articles et invite les membres et les experts en contenu à lui faire part de leurs commentaires. Une fois les commentaires reçus, la littérature est à nouveau consultée et des décisions sont prises à l'effet que l'article devra être modifié ou que le texte original sera retenu. Nous affichons également tous les commentaires reçus dans la section *Réservée aux membres* du site Web de l'ACHD afin que vous puissiez lire ce que les autres pensent du projet d'article et quels sujets ont été notés comme étant pertinents.

Après la parution de la dernière trilogie d'articles portant sur l'utilisation de la soie dentaire, sur le brossage des dents et sur le rinçage buccal, nous avons reçu de très intéressants commentaires. Certains membres se demandaient pourquoi nous nous attardions à ces questions alors qu'elles sont une occurrence si quotidienne pour les hygiénistes dentaires qu'elles ne pensaient pas que c'était utile de se servir des ressources de l'ACHD pour les analyser. D'autres se questionnaient sur les paramètres de la recherche concernant les analyses de la littérature, les trouvant beaucoup trop restreintes pour constituer entièrement une bonne étude.

Les récompenses des défis *...suite page 335*

This article has been peer reviewed.

Review of the Oral Disease-Systemic Disease Link. Part I: Heart Disease, Diabetes

Canadian Dental Hygienists Association Position Statements

Heart disease

Recent research indicates a low-to-moderate association between periodontal disease and heart disease and a moderate association between periodontal disease and stroke. In light of this, dental hygienists should educate clients at risk for these diseases about the potential risks and encourage oral disease prevention and treatment for this client population.

Diabetes

Recent research indicates mounting evidence of a probable bi-directional association between periodontal disease and diabetes. In light of this, periodontal prevention and treatment programs for persons with diabetes should be available, regardless of income level. In addition, dental hygienists should consider incorporating the following dental hygiene diagnosis and treatment issues into their practices; however, all clinical decisions should be based on the needs of the specific client:

- Educate clients with diabetes about the probable association between diabetes and periodontal disease and provide disease prevention and treatment services for individuals with diabetes.
- Increase interprofessional collaboration and communication between dental hygienists and other health professionals working with persons with diabetes. These new opportunities can focus on oral/general health assessments, leadership capacity, policy development, surveillance, program delivery, and evaluation.

Keywords: Diabetes mellitus; Heart diseases; Meta-analysis; Oral hygiene; Periodontal diseases; Review literature

CDHA Position Paper

by Judy Lux, BA, MSW

Periodontal disease may be the most prevalent chronic disease affecting children, adolescents, adults, and the elderly.

INTRODUCTION

THIS PAPER UPDATES THE 2004 CDHA POSITION PAPER entitled "Your Mouth – Portal to Your Body," on the links between oral health and general health.[1] The evidence from the 2004 paper, although preliminary, supports the conclusion that oral diseases may have an association with the occurrence and severity of diabetes mellitus and heart disease. In addition, the review found that oral hygiene treatment improved diabetic control of type 2 diabetes. Following the publication of the 2004 position paper, substantial new research on this topic has been published. The 2006 position paper updates the 2004 position paper with the growing body of research supporting a link between oral diseases and systemic diseases.

Periodontal disease may be the most prevalent chronic disease affecting children, adolescents, adults, and the elderly.[2] 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 severe periodontal disease is 14% for adults aged 45 to 54 and 23% for those aged 65 to 74.[3] Similar recent information for all of Canada is not available; however, 35 years ago, 15% of Canadians aged 19 years and over had periodontal pockets (Nutrition Canada National Survey).[4] Many research studies define periodontal disease as periodontitis and gingivitis. Almost half of adults in the United States aged 35 to 44 have gingivitis.[3] Similar proportions are believed to exist in Canada, although data are lacking.

METHODOLOGY

The methodological approach in this paper is a comprehensive review of systematic reviews, meta-analyses, and literature reviews on the connection between periodontal diseases and systemic diseases, specifically, preterm low birth weight, respiratory disease, diabetes, and heart disease. The research question was "What is the relationship between periodontal disease and the following four health issues: preterm low birth weight babies, diabetes mellitus, heart disease, and respiratory disease?" This question was used to develop the following search terms: periodontal disease, periodontal diseases, periodontitis, heart disease, heart diseases, cardiovascular disease, cardiovascular diseases, coronary heart disease, preterm birth, preterm births, low birth weight, low birth weights, pregnancy and pregnancy outcomes, diabetes mellitus, respiratory disease, respiratory diseases, chronic obstructive pulmonary

Cardiopathie

Déclaration de l'ACHD

Une recherche récente indique un lien faible à modéré entre la maladie parodontale et la cardiopathie ainsi qu'un lien modéré entre la maladie parodontale et l'accident vasculaire cérébral. À la lumière de ces résultats, les hygiénistes dentaires devraient éduquer les clients à risque pour ces maladies sur les risques potentiels et encourager la prévention et le traitement des affections buccales pour cette population de clients.

Discussion des méta-analyses

Les éléments probants de ces deux méta-analyses (Janket et al., 2003;[13] Khader et al., 2004[26]) indiquent que les personnes souffrant de maladie parodontale ont un risque accru, de léger à modéré, de développer une maladie cardio-vasculaire ou cérébrovasculaire et un risque modéré d'avoir un accident vasculaire cérébral. Les sommaires des risques relatifs rapportés dans ces deux méta-analyses sont cohérents avec les résultats d'un certain nombre d'autres études menées à ce jour (indiquées dans la section littérature). Bien que le risque rapporté soit faible à modéré, il peut avoir un impact modéré à élevé sur la santé publique puisque presque la moitié de la population canadienne peut avoir une gingivite (laquelle est incluse dans certains études dans la catégorie des maladies parodontales. Compte tenu que la maladie cardio-vasculaire est la principale cause de décès au Canada et que les coûts associés au traitement sont élevés, il peut également y avoir un impact sur la vie des Canadiens et Canadiennes et sur le système de santé canadien. Ces méta-analyses donnent un appui préliminaire à la prévention des maladies parodontales chez les personnes à risque ou souffrant de maladie cardio-vasculaire. La preuve est faite ; cependant, en l'absence d'études sur les traitements ou d'essais randomisé contrôlés, il est difficile d'identifier les changements spécifiques à apporter à la pratique clinique.

Diabète

Déclaration de l'ACHD

Une récente recherche indique qu'il y a de plus en plus de raisons de penser à un lien bidirectionnel probable entre la maladie parodontal et le diabète. À la lumière de ces résultats, des programmes de prévention et de traitement devraient être offerts aux personnes atteintes de diabète, peu importe leur niveau de revenu. De plus, les hygiénistes dentaires devraient songer à inclure le diagnostic et les traitements suivants en hygiène dentaire dans leur pratique ; toutefois, toutes décisions cliniques devraient être basées sur les besoins spécifiques du client :

- Éduquer les clients atteints de diabète sur le lien probable entre le diabète et la maladie parodontale et offrir des services de prévention et de traitement de la maladie aux personnes atteintes de diabète.
- Accroître la collaboration et la communication interprofessionnelles entre les hygiénistes dentaires et les autres professionnels de la santé qui travaillent auprès des personnes atteintes de diabète. Ces nouvelles possibilités peuvent être centrées sur les évaluations de l'état général de santé et de la santé buccodentaire, la capacité de leadership, le développement de politiques, la surveillance, la mise en œuvre de programmes et l'évaluation.

Discussion

Une preuve substantielle, provenant d'une étude méthodique réalisée en 2006 (Khader et al.)[38] et d'une analyse documentaire réalisée en 2004 (Taylor et al.),[39] laquelle inclut un grand nombre d'études, confirme l'existence d'un lien entre la maladie parodontale et le diabète. La méta-analyse de 2006 est davantage étayée que les méta-analyses dont il est question dans la section traitant de la cardiopathie de ce journal parce qu'elle inclut deux essais randomisés contrôlés, lesquels sont la norme d'or en recherche. La relation se révèle être bidirectionnelle et possiblement une relation de cause à effet. En fait, un faible contrôle glycémique peut être un facteur de risque de maladie parodontale et la maladie parodontale peut avoir un effet indésirable sur le contrôle glycémique. En plus des résultats de la recherche, plusieurs autres questions doivent être prises en considération lors du développement de politiques sur la santé pour les personnes atteintes de diabète. La prévalence du diabète dans la population peut augmenter avec le temps et, même de petites diminutions dans le taux d'hémoglobine glyquée (hémoglobine A1c) peuvent amener des réductions importantes dans certaines complications ultérieures du diabète, incluant la cécité, la néphropathie, l'hypertension artérielle et la maladie cardio-vasculaire.[40] De plus, la maladie parodontale peut être prévenue et traitée. Par conséquent, le traitement parodontal des personnes atteintes de diabète peut avoir d'importantes répercussions sur la santé publique et une demande pour des programmes de prévention et de traitement des maladies parodontales destinés aux personnes atteintes de diabète, peu importe leur niveau de revenu, est justifiée.

disease, pneumonia, lung disease, and respiratory tract infections.

The literature was limited to English language human studies in MedLine, the Cochrane controlled trials register, and Google Scholar. The search also included reference lists of published review papers to identify additional articles. The search cut-off date was March 2006 although one systematic review was included from September 2006. The search also included "gray" literature—information not reported in the scientific periodical literature—and websites known to contain publications on this topic. A recognized topic expert was consulted at a number of developmental stages followed by a consultation with the draft paper for CDHA members and other topic experts.

HEART DISEASE

Literature review

Cardiovascular disease (CVD), which includes coronary heart disease (CHD), atherosclerosis, coronary thrombosis, ischemic heart disease, and peripheral vascular disease, accounts for the death of more Canadians than any other disease. In 2003, it accounted for 33%[5] of all deaths and costs the Canadian economy over $18 billion a year.[6] Of these deaths, 21% were due to cerebrovascular diseases.[7]

In the 2004 CDHA position paper, 15 of 17 studies reviewed supported an association between periodontal disease and cardiovascular disease.[8] Several other reviews of the literature reach similar conclusions: in 2002, Hujoel reviewed periodontitis and CHD studies,[9] Genco et al. reviewed periodontal and heart diseases,[10] and Joshipura reviewed oral conditions and stroke and peripheral vascular disease.[11] In addition, Danesh in 1999 conducted a meta-analysis of the literature on this topic and concluded that persons with periodontal disease have a 21% risk of CVD.[12] In a review by Janket in 2003, only four studies identify some conflicting evidence showing that the relationship between periodontal disease and CVD is not strong.[13]

These reviews summarized a substantial amount of research, which indicates a possible association between periodontal disease and CVD. In addition, some researchers report that, due to the association between periodontal disease and cardiovascular disease, there is a need to refocus attention on primary and secondary oral disease prevention.[14] However, these reviews cannot establish a causal relationship between periodontal disease and CVD, since they included primarily case control and cohort studies. Randomized controlled trails (RCTs) are the highest level of evidence and the only studies that can indicate a causal relationship.* A review by the Royal College of Dental Surgeons of Ontario questions whether confounding variables such as smoking, which increased risk of both heart disease and periodontal disease, might be influencing some of the outcomes of the research studies.[15]

One recently reported retrospective two-year study examines the impact of periodontal treatment on CVD. It investigated the effect of periodontal treatment on 144,225 health plan members (with medical and dental insurance plans) with one of three conditions: diabetes, coronary artery disease (CAD), and cerebrovascular disease. Costs per member per month showed that members with diabetes, CAD, and cerebrovascular disease who had periodontal treatment, as opposed to dental maintenance services, had lower medical costs. Although this study is not high-level research and has not undergone the rigors required for publication, it supports the need to conduct other treatment studies using RCTs.[16]

Although there is a need to conduct RCTs to determine a causal link between periodontal disease and heart disease, as well as to determine if periodontal treatment reduces the risk of CVD, there are several difficulties with conducting RCTs in this area. Heart disease develops over time and researchers cannot predict from the outset of a study if heart disease will develop. If the researchers randomly select 100 individuals and allocate them to a periodontal treatment or control group, it may be years before some of the people develop heart disease. Another complication is that asking people to forego periodontal treatment for long periods is unethical. Therefore, the RCTs need to focus on people who have developed heart disease, since a certain percentage of these people will experience a second cardiovascular event. A new National Institute of Dental and Craniofacial Research (NIDCR) pilot project uses this design.[17] Individuals who have had one cardiovascular event will be allocated to treatment/no treatment groups to determine whether periodontal treatment has an impact on the development of further cardiovascular events.

Three biological mechanisms have been proposed to explain the association between periodontal disease and CVD (see figure 1).[8]

- Bacteria from the periodontal infection enter the blood and invade heart and blood vessel tissue causing harmful effects.
- The body responds to the periodontal infection with the production of inflammatory mediators that travel through the blood and cause harmful effects on the heart and blood vessels.
- Bacterial products such as lipopolysaccharides enter the blood and cause harmful effects on the heart and blood vessels.

The most recent evidence of this biological mechanism comes from a 2005 study showing that people with higher levels of bacteria in their mouths also tended to have thicker carotid arteries, an indicator of cardiovascular disease.[18] In another recent 2005 systemic study, antibody response to periodontal bacteria was associated with coronary heart disease.[19] It is interesting to note that in this study, the clinical signs of periodontal disease were not associated with CHD, but it was suggested that the quantity and quality of the immune response against oral bacteria provides a better measure of the association between periodontal disease and CHD. Other scientific evidence of

* A randomized controlled trial is an experiment where the investigator randomly assigns the subjects into groups to receive or not receive one or more interventions that are being compared.

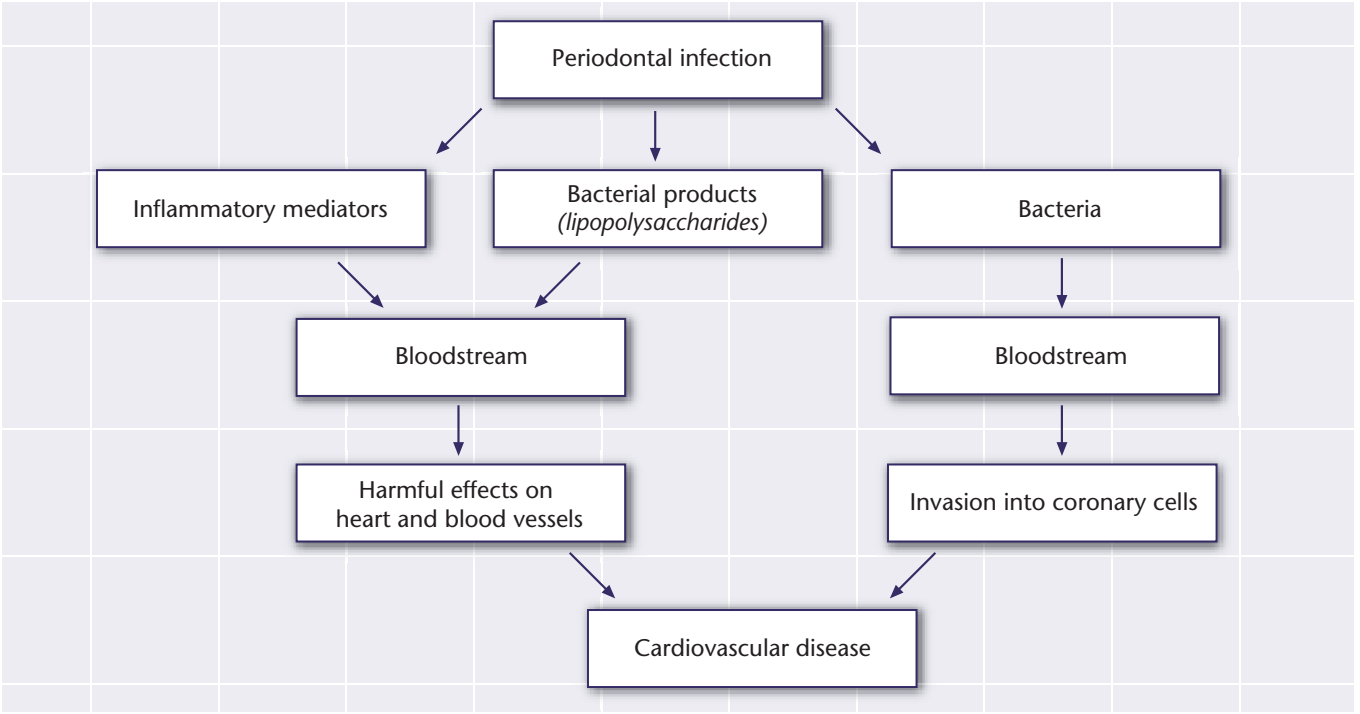

Figure 1. Proposed biological mechanism (association between periodontal disease and CVD)

these mechanisms comes from studies showing periodontal micro-organisms are found in the plaque build-up in the arteries.[20,21] Also, recent findings show that the inflammatory mediators such as lipoprotein and triglycerides are significantly higher in subjects with periodontitis than in controls.[22] In addition, increased levels of C-reactive protein were associated with periodontitis.[23] C-reactive protein is considered a biomarker for inflammation and is associated with elevated risk of heart disease.

Recently, researchers are suggesting there may also be a need for RCTs that explore the association between biological markers of periodontal disease and specific periodontal pathogens, instead of only clinical signs. This suggestion is supported by Janket et al.'s 2004 research showing that the more precise the dental health score, the stronger its associations with CHD and stroke.[24] Janket used a recently developed Asymptotic Dental Score that used all dental factors expected to generate inflammatory mediators, such as dental caries, dentate status, and root remnants. This score was used along with the traditional Total Dental Index (TDI). Spahr et al.[25] in 2006 also supports this suggestion for studying biological markers as opposed to clinical signs. Their study showed that microbiological parameters, such as total periodontal pathogen burden, is of greater importance as a potential risk factor for CHD than the clinical parameter such as the Community Periodontal Index of Treatment Needs (CPITN).[25]

RESULTS

The search retrieved two meta-analyses pertaining to this topic area. The first meta-analysis conducted in 2003 showed that individuals with periodontal infection had a higher summary relative risk (RR) of future cardiovascular events (RR 1.19 95% CI, 1.08-1.32), with a slightly higher risk of 1.44 (95% CI, 1.20-1.73) for individuals </= 65 years of age. In addition, individuals with periodontal disease had a higher risk of future stroke (RR 2.85, 95% CI, 1.78-4.56).[13] The authors conclude that periodontal disease is associated with a 19% increase in risk of future cardiovascular disease. This meta-analysis included nine cohort studies (eight prospective and one retrospective) (see reference list A). The author reports that confounding in some studies likely overestimated the risk by 12.9% and the use of client questionnaires to identify periodontal disease in other studies underestimated the risk by 29.7%. The balance of these two estimates indicates that the summary RR is probably underestimated. Periodontal disease was defined as gingivitis or periodontitis. The authors suggest that since CVD is multifactorial, all known means of prevention should be implemented, including oral hygiene maintenance.[13]

The second meta-analysis conducted in 2004 examined observational studies and found that periodontal infection increases the risk of cerebrovascular disease and coronary heart disease (CHD).(25) Subjects with periodontitis had an overall adjusted relative risk of CHD that was 1.15 times (95% CI: 1.06-1.25; P=0.0001) the risk for healthy subjects. Subjects with periodontitis had an overall adjusted relative risk of cerebrovascular disease of 1.13 (95% CI: 1.01-1.27; P=0.032). The meta-analysis included seven cohort studies and four cross-sectional and retrospective studies (see reference list B). The studies defined periodontal disease as gingivitis or periodontitis. The authors conclude that larger and better-controlled studies are needed to clarify the association between periodontal disease and CHD.

DISCUSSION

The methodology in both meta-analyses was very good, with a number of design strengths. Both clearly defined a quality criteria checklist for inclusion/exclusion of research and no publication bias was evident. Researchers in the 2003 meta-analysis took into account external validity, adequate follow-up, and also adjusted for confounders. They also gave extra points when it was possible to generalize to the whole population and when there was an extensive >10-year follow-up. However, current debate in research centres on the difficulties in adjusting for confounders. In addition, the 2004 meta-analysis found no heterogeneity when the overall relative risk was estimated from the seven individual studies. One of the drawbacks to the 2004 meta-analysis was that not all of the studies adjusted for established cardiovascular risk factors such as age, gender, cholesterol, weight, smoking, diabetes, and hypertension.

There are several other drawbacks to these meta-analyses. One drawback was that gingivitis and periodontitis studies were combined. It is reported that potential biological mechanisms may apply to periodontitis and not to gingivitis.[27] Studies on these two diseases, therefore, should be analyzed separately. Also, given that gingivitis is far more common than periodontitis, studies that separate these two diseases would provide more useful information on the need to screen and treat each disease. In addition, the meta-analyses did not include any randomized controlled trials, the gold standard in research.

The evidence from these two meta-analyses indicates that individuals with periodontal disease have a small-to-moderate increased risk of developing CVD and cerebrovascular disease and a moderate risk of developing a stroke. The summary relative risks reported in these two meta-analyses are consistent with the results from a number of other reviews conducted to date, which are mentioned in the literature section. Although the reported risk is small to moderate, the risk may have a moderate-to-high impact on public health, since almost half of the Canadian population may have gingivitis (which is included in some studies under the category of periodontal disease). Since cardiovascular disease is the number one cause of death in Canada and high costs are associated with treatment, there may also be a significant impact on the lives of Canadians and Canada's health care system. These meta-analyses provide preliminary support for preventing periodontal disease in individuals at risk for or suffering from CVD. The evidence is mounting. However, in the absence of treatment studies or RCTs, it is difficult to identify specific clinical practice changes.

DIABETES

Literature review

From 1999 to 2000 in Canada, there was a 5.1% prevalence of diabetes among adults.[28] One of the most striking health-related impacts of diabetes is that adults are twice as likely to die prematurely compared with adults without diabetes.[28] The prevalence of diabetes appears to be increasing over time and approximately 35% of adults are unaware that they have the disease.[29] Diabetes takes an immense financial toll on Canadians, costing $9 billion in health care, disability, work loss, and premature death.[29]

There is a growing body of research indicating a bi-directional relationship between periodontal disease and diabetes.[30,31] If clients have diabetes, they may be at greater risk of periodontal disease. And if clients have periodontal disease along with diabetes, the PD may be more severe than if they did not have diabetes. In addition, the treatment of periodontal disease is more difficult in a client with poorly controlled diabetes. Preliminary evidence from a double-blind randomized study confirms that periodontal therapy (scaling and root planing, plus metronidazole) leads to improvements in glucose control.[32] Other research shows that improved glucose control can result from mechanical periodontal therapy combined with anti-microbial treatment.[33,34] Poor glycemic control is recognized as a significant risk factor for complications related to diabetes, such as blindness, kidney failure, and heart and blood vessel disease.

The American Diabetes Association (ADA) acknowledges the link between periodontal disease and diabetes in their 2003 *Report on the Diagnosis and Classification of*

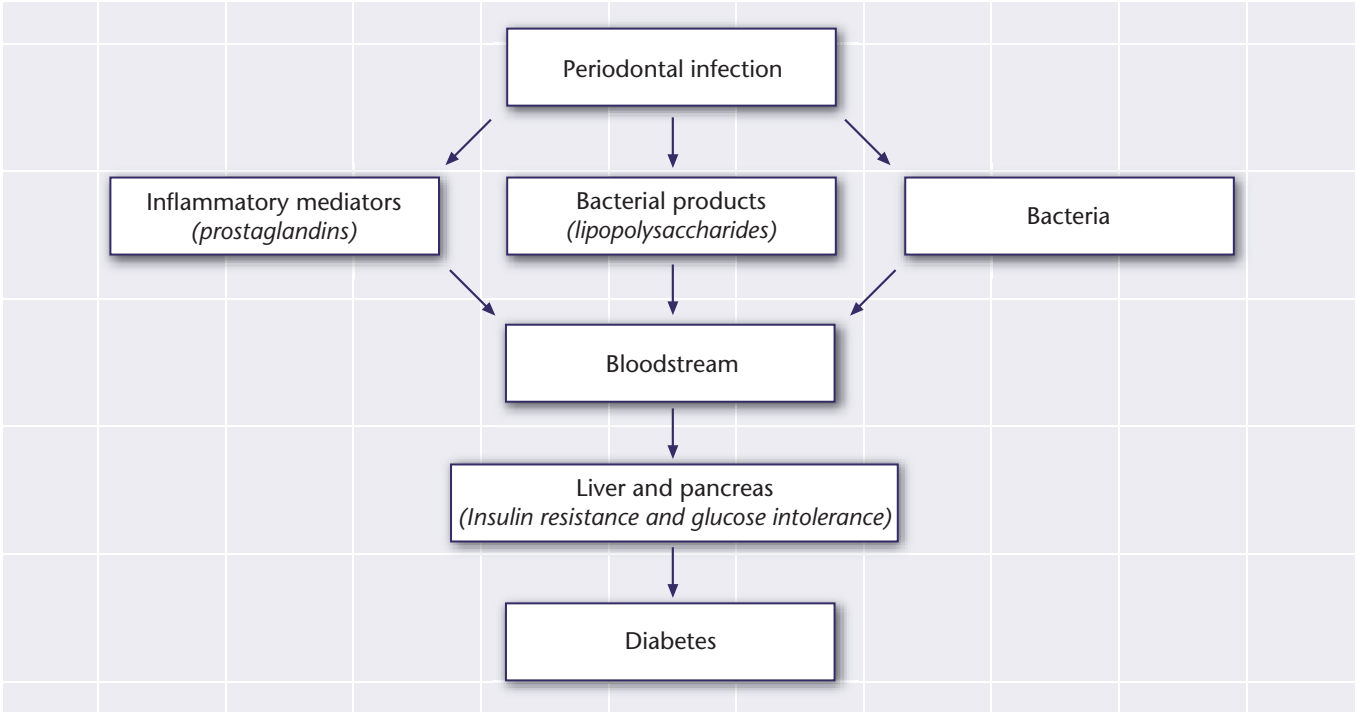

Figure 2. Proposed biological mechanisms (association between periodontal disease and diabetes)

Diabetes Mellitus: "periodontitis is often found in people with diabetes."[35] In 2000, the American Academy of Periodontology (AAP) took a strong public stand on this issue in their 1999 position paper[36] that acknowledges a bi-directional relationship between periodontal disease and diabetes. The AAP statement recommends that the oral health professional contact clients' physicians to inform them of any periodontal diseases, since periodontal infection may increase insulin resistance, lead to a worsening of the diabetic state, and increase the risk for diabetic complications. The position paper cites several studies, including controlled clinical trial evidence, to support the conclusion that mechanical therapy combined with systemic tetracycline antibiotics may improve glycemic control.

Although the exact biological mechanism of action has not been clearly established, there are several possible explanations. One of the proposed mechanisms to explain the bi-directional relationship between periodontal disease and diabetes is that they both stimulate the chronic release of proinflammatory cytokines that have a deleterious effect on periodontal tissues and interfere with insulin action. Bacteria and bacterial products also may produce insulin resistance and glucose intolerance.[8] The periodontal infection provides a source of micro-organism products such as lipopolysaccharides, which may amplify the magnitude of the advanced glycation end (AGE) product–mediated cytokine upregulation. Some researchers propose that periodontitis may even predispose individuals to the development of type 2 diabetes.[37]

RESULTS

A 2006 meta-analysis examined the extent and severity of periodontal diseases between diabetics and non-diabetics.[38] The meta-analysis was based on international studies including 18 comparative cross sectional studies, 3 prospective cohort studies, and baseline data from 2 clinical trials (see reference list C) comparing oral hygiene, gingival and periodontal status. The study shows the severity of periodontal disease was significantly higher in diabetics compared with non-diabetics but the extent of the disease was the same in both groups. The difference in the average of plaque index between diabetics and non-diabetics was statistically significant at 0.218 (95% CI, 0.098-0.330); the gingival index was 0.147 (95% CI, 0.012-0.281); probing pocket depth was 0.346 (95% CI, 0.194-0.498); clinical attachment loss, bleeding on probing, and the calculus index was not significant. The authors conclude that there is a need for educational campaigns and intensive intervention programs for diabetic clients with periodontal disease.

A 2004 review[39] examined 42 observational studies (see reference list D) and found that overall there was consistent evidence of greater prevalence, incidence, severity, extent, or progression of periodontal disease in individuals with diabetes. The evidence also supports a bi-directional relationship between periodontal disease and diabetes. In addition, a dose-response relationship provides some support for a cause-effect relationship. The review examined 25 observational studies and found that there is insufficient evidence to conclude there is an association between tooth loss, coronal or root caries, and diabetes. The 2004 review did not include any analysis of relative risk. The authors conclude that this evidence supports oral examinations and periodontal prevention and treatment for persons with diabetes.

DISCUSSION

The 2006 meta-analysis had some good design features, including pre-stated inclusion criteria. In addition, the author included international literature including studies from France, Turkey, Sweden, Finland, and the United States. This meta-analysis holds more strength than the meta-analyses in the heart disease section of this paper, since it included two randomized controlled trials.

These highlights may be considered along with the minor drawbacks to the analysis. The authors combined studies with different study populations, ages and sizes; and different diagnostic criteria for periodontal disease, resulting in a high degree of heterogeneity between studies. The author also included very dated studies, including two from the 1970s and four from the 1980s. Studies from these decades may vary greatly in their statistical analysis technique compared with more recent studies. Another drawback is the small difference in oral health status measures between the diabetic and the non-diabetic groups. Since there is growing international research on this topic, there is a need to develop international standards for the definition and diagnostic criteria for periodontal disease, which would allow more accurate pooling of original data. This would avoid the possibility of combining the odds ratios, relative risk and P values from two non-significant studies that may give significant results.

Substantial evidence from the 2006 systematic review and a review of the literature in 2004, which includes a large number of studies, supports an association between periodontal disease and diabetes. The relationship appears to be bi-directional and possibly a cause-effect relationship. That is, poor glycemic control may be a risk factor for periodontal disease and periodontal disease may have an adverse effect on glycemic control. In addition to the outcomes of the research, several other issues may be considered when developing health policies for persons with diabetes. The prevalence of diabetes in the population may be increasing over time, and even small reductions in glycated hemoglobin (hemoglobin A1c) can result in dramatic reductions in some of the later complications of diabetes, including blindness, kidney disease, high blood pressure, and cardiovascular disease.[41] In addition, periodontal disease can be prevented and treated. Therefore, periodontal therapy for the person with diabetes may have potentially great implications for public health; a call for periodontal prevention and treatment programs for persons with diabetes, regardless of income level, is warranted.

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Thoughts on Critical Thinking by a Dental Hygienist

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ABSTRACT

Thinking about thinking is an activity requiring skills such as analysis, interpretation, and inference. It is also necessary to want to think or be motivated to think, that is, be disposed to do so. It was only in the 20th century, 1990 to be specific, that the American Philosophical Association defined critical thinking. In 2000, the nursing profession did so in the context of nursing. The dental hygiene profession has yet to articulate what is meant by critical thinking as it is used in the profession. The purpose of this exposition is to generate discourse and dialogue among the dental hygiene community so they too arrive at the meaning of critical thinking in the context of their profession; critical thinking is an ability of the competent dental hygienist.

Keywords: thinking, cognition, judgment, critical thinking

INTRODUCTION

IMAGINE AN OLIVE TREE, A FEW BOULDERS, A WARM breeze, and a gathering of a few people wrapped in robes. They have come together to contemplate the relativity of life, the purpose of being, to think about a course of action. It is a common enough sight, these people thinking. The image alludes to time as a non-issue in the thinking process. The process of thinking is seemingly of utmost importance; it appears to have a thoughtful, systematic metre. The image is good.

Imagine three great philosophers:[1] Socrates (469–399 BC), who figuratively begat Plato (427–347 BC), who begat Aristotle (384–324 BC). Socrates asks his student Plato to think, to do so as an active, living "thing"; to beware of doing so without "suspension of critical thought." Plato generates thought around the trinity of the intellect, the spirit, and the body as the living thing—this thinking. Aristotle, student of Plato, proposes that knowledge is fundamentally empirical, that what is known is known through observation and experience. Thought given to thinking; thinking about thought. Is this field of inquiry just for philosophers, people who have dedicated their life's work to contemplating thinking? Or is "thinking about thinking" a responsibility for us "common folk," that is, those of us not schooled in philosophy?

Imagine travelling through the next centuries when land masses are discovered; wars are fought; and the "-ology" of many disciplines brings increased understanding to life and its existence. René Descartes (1596–1650), a French philosopher, becomes famed for his expression *cogito ergo sum*—"I think, therefore I am." George Berkeley (1685–1783) states *esse est percipi*—"to be is to be perceived," that perception of the external reality produces ideas in our own minds; that we see and interpret and do based on our perceptions; that we are mind-dependent. Thorndike (1912) presented critical thinking as a person's general power to respond well in thought, action, and feeling.[2] The thought behind thinking continues as we are influenced by scientists and philosophers, who continually push and pull, suggest and query, and provoke us to know *how* to know (epistemology). Is it through our senses that we perceive and understand our environment? Is it because of empirical observation or faith? How is it that we know?

Plato, Aristotle, and Socrates and those who followed through the centuries believe critical thinking to be a teachable skill, not only the subskills involved such as interpretation and analysis, but the motivation and interest to do so ("willing to consider, diligent").

This exposition is on critical thinking as a competency or an ability of the dental hygienist. Questions that come to mind are "What is meant by "critical thinking?" and "What does critical thinking mean to the dental hygienist?" Why is the attributive adjective *critical* used? Is the very act of thinking, not critical? If, in the 21st century, philosophers continue the quest of embodying critical thinking, then these are good queries for the dental hygiene profession. Among those philosophers are a few dental hygiene scholars who, centuries later, follow the lead of the robed people sitting under the olive tree. This exposition on critical thinking as an active living thing is meant to generate dialogue, debate, and discourse amongst the dental hygiene community to bring to fruition the meaning of critical thinking as an ability or competency of the dental hygienist. Given that the discussion is on thinking, the style of writing is purposeful so the thinking is transparent. Hence the use of punctuation such as dashes and parentheses so the reader may "see"

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RÉSUMÉ

Penser au sujet de la pensée est une activité qui demande des habilités comme l'analyse, l'interprétation et l'inférence. Il semble qu'il est également nécessaire de vouloir penser ou d'être motivé à penser, donc qu'il faut être disposé à le faire. Ce n'est qu'au 20e siècle, en 1990 pour être spécifique, que l'American Philosophical Association a défini la pensée critique. En 2000, la profession infirmière l'a également fait dans le contexte des soins infirmiers. La profession de l'hygiène dentaire a encore à bien formuler ce que signifie la pensée critique telle qu'utilisée dans la profession. Le but de cet exposé est de générer un discours et un dialogue parmi la communauté des hygiénistes dentaires afin qu'elles arrivent à définir la pensée critique dans le contexte de leur profession ; la pensée critique est une habileté des hygiénistes dentaires compétentes.

what the author is thinking—a liberty taken to entice discourse.

CRITICAL THINKING: A COMPETENCY IN THE 20TH AND 21ST CENTURIES

Today, we common folk need only do a Google search to realize that the search for what is thinking, critical thinking to be more specific, results in a multitude of definitions from which to choose. The competent person, from every walk of life, possibly in nearly all professions, is described as being able to critically think. That this is true of the dental hygiene profession is supported, for example, by the Pew Health Professions Commission,[3] the Commission on Dental Accreditation of Canada,[4] the Institute of Medicine,[5] and learning outcomes or competencies of dental hygiene education programs across the country. The 1980s brought the need to learn *how* to learn, which gave rise to the need for critical thinking beginning from early years to post-secondary years,[6] and then continuing as an expectation of the health professional.[3] Education in the early years and high schools responded, for example, through health education classes on lifestyle choices.[7-12] Universities and colleges developed centres on/for critical thinking; websites abound, as do resources on developing critical thinking skills. We entered a paradigm on critical thinking; not that we created it; we just reintroduced it. We returned to the roots of the olive tree where thought was given to thinking.

In the 20th century, thinkers from many disciplines gathered from the United States and Canada to participate in the American Philosophical Association (APA) session on defining critical thinking.[6] Using the Delphi Method, they conceptualized critical thinking as an essential tool of inquiry and a powerful resource for any individual to use in all aspects of their life. Critical thinking was collectively characterized as follows: the purposeful self-regulated judgment using the cognitive skills of interpretation, analysis, evaluation, inference, and explanation. The group described the ideal critical thinker as follows:

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit (Facione 1990, p. 3).[6]

Plato, Aristotle, and Socrates and those who followed through the centuries believe critical thinking to be a teachable skill, not only the subskills involved such as interpretation and analysis, but the motivation and interest to do so ("willing to consider, diligent"). An olive tree and time—that image of the scholars and their students thinking, pondering and reflecting—gives the impression that contemplative thought is permitted and supported as part of the thinking process. The thinker actively engages in the act of thinking and begins the process. If this is an "active living thing," then an able person, given the time and exposure to the skills involved can learn to think critically, given of course that they want to do so.

Williams et al. (2003) suggest that time is not available in the dental hygiene curriculum to teach critical thinking skills and that, based on nursing and medical experience, it may be important to ensure that students have this prerequisite skill on entering the health professions.[13] Given this assumption, Williams et al. conducted a study on the predictive validity of critical thinking skills for initial clinical dental hygiene performance. Nearly 200 first-year dental hygiene baccalaureate-level students from seven United States programs participated in the study. Phase I consisted of a consensus agreement among a panel of experts regarding content validity of the clinical measurement. Phase II of the study identified the student participants. Phase III involved the first-year students completing the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Disposition Inventory (CCTDI) during the first week of classes and again early in the second semester. The CCTST assesses the following abilities: analysis, inference, evaluation, and inductive and deductive reasoning. The CCTDI looks at inquisitiveness, organization of inquiry, value of reason, truth seeking, open-mindedness, self-confidence, and maturity. Williams et al. found the CCTST scores gave a good prediction of initial student outcomes, but the student scores did not change from one semester to the next. This suggested the programs did not provide learning environments conducive to increasing critical thinking skills. The CCTDI scores appeared to have no correlation with student performance. Can a person be capable of critical thinking, but not be inclined to do so?

CRITICAL THINKING VERSUS CRITICAL DISPOSITION

For us common folk, the question must come up as to what is meant by critical thinking versus critical disposition. Is critical thinking the actual act of doing it and critical disposition more the interest or inclination to do it? Facione (1990), an often referenced leader in critical thinking in general and in health professional literature on critical thinking, authored the APA Delphi (Expert Panel) Report on Critical Thinking.[6] The panel distinguishes between critical thinking skills and critical thinking disposition, the motivation to critically think. These experts conclude people may be capable of critical thinking but not be good critical thinkers. They may demonstrate some degree of critical thinking but not be too effective at it simply because they do not put the effort or interest into the act of doing it. The dental hygienist who becomes drawn away from client-centred care due to barriers to optimal practice such as superimposed time limitations or appointment scheduling for their clients may be failing to be a critical thinker. They may be capable of it, but because they have not put effort into seeking ways to remove the barriers to their practice, they are not effective at critical thinking. A person has to want to be engaged in this "active living thing," to be disposed to being a critical thinker.

The panel distinguishes between critical thinking skills and critical thinking disposition, the motivation to critically think.

The majority of the APA Delphi Expert Panel recognized critical disposition as integral to critical thinking.[6] They speak to the "critical spirit" being the probing, inquisitive, keen mind with a quest for reason and information. Boxes 1 and 2 provide the definitions from the report for critical thinking and critical disposition, respectively. The panel illustrated the difference between the two concepts with the following statement: "This person is a critical thinker, but this other person is so mentally lazy, close-minded, unwilling to check the facts and unmoved by reasonable arguments that we simply cannot call him a critical thinker" (Facione 1990, p. 12).[6] Thinking—both the skill and being disposed to it—requires more than just the know-how (cognition). It seems necessary to also value and believe in it (affection). The synergy of both the skill and disposition creates the good critical thinker.

MATURATION OF CRITICAL THINKING—THE CONCEPT IN NURSING AND DENTAL HYGIENE

A simple, yet complex, question: "Is critically thinking different than just thinking? Why is there need for an adjective (critical) to precede the verb 'think'?" This is a fairly straightforward but good question, given that the 20th century brought critical thinking to the curriculum from the early years through to and including the post-secondary years.[6] Where was it before? How did we stray from Socrates', Plato's, and Aristotle's lead in thinking?

Box 1: Critical Thinking Defined. *The American Philosophical Association Delphi Report on Critical Thinking* (Facione 1990, p. 3)[6]

"We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills with nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society"

Box 2: Affective Disposition of Critical Thinking. *The American Philosophical Association Delphi Report on Critical Thinking* (Facione 1990, p. 11) [6]

TO LIFE AND LIVING IN GENERAL

- Inquisitiveness with regard to wide range of issues
- Alertness to opportunities to use critical thinking
- Self-confidence in one's own ability to reason
- Flexibility in considering alternatives and opinions
- Fair-mindedness in appraising reasoning
- Willingness to reconsider/revise views where honest reflection suggests that change is warranted
- Honesty in facing one's own biases, prejudices, stereotypes, egocentric or sociocentric tendencies
- Concern to become/remain generally well-informed
- Trust in the processes of reasoned inquiry
- Open-mindedness regarding divergent world views
- Understanding of the opinions of other people
- Prudence in suspending/making/altering judgments

TO SPECIFIC ISSUES, QUESTIONS, OR PROBLEMS

- Clarity in stating the question
- Diligence in seeking relevant information
- Care in focusing attention on the concern at hand
- Precision to the degree permitted by the subject and the circumstance
- Concern orderliness in working with complexity
- Reasonableness in selecting and applying criteria
- Persistence though difficulties are encountered

In preparing this exposition for a dental hygienist audience, one of the first approaches (inquiries) was to look at the health professional literature. The first line of query was to use Medical Subject Headings (MeSH) site as this gives recognized terms by library categorization. A MeSH search in March 2006 revealed that critical thinking is not listed but thinking (97,344 articles) is. "Thinking" is further refined into the following subcategories: judgment, problem solving, concept formation, decision making, creativeness, and esthetics. A PubMed/Medline search using "judgment" OR "'problem solving" produced 19,749 articles on nearly every imaginable topic. Just using PubMed/Medline without MeSH terms, a search for "critical thinking" produced 4,159 articles; if entered as a phrase, 997 articles resulted. This is a substantially lower number, indicating perhaps it is a more contemporarily used word in the health professions.

A search using "'critical thinking" AND "nursing" resulted in 1,350 articles. If used as a phrase, 655 articles appear in the nursing literature, presumably part of the 997 in total in PubMed/Medline. This suggests the nursing profession is relatively rich in "thinking" on critical thinking in nursing. Many of the investigators are searching for what critical thinking means in nursing and how nursing employs critical thinking. The same search using dental hygienist and the phrase "critical thinking" produced 4 articles. A search using the MeSH terms "judgment" and "problem solving" and "dental hygienist" resulted in 15 articles. If "thinking" and 'dental hygienist" are used, the number rises to 119. It would appear, based on the search term "critical thinking," that the dental hygiene profession is beginning to enter the paradigm from thinking to critical thinking—it's the "new" thinking.

Of the four articles that appear in the dental hygiene literature using the phrase "critical thinking" and "dental hygiene," only Williams et al.[6] investigates critical thinking as a variable in the study. The others use the term critical thinking as it is being used by the profession, as part of dental hygiene abilities. Christie et al. (2003) refer to critical thinking (undefined in text) as part of ethical reason-

ing in dental hygiene practice.[14] Chichster et al. (2001) investigated the utilization of evidence-based teaching in United States' dental hygiene curricula, stating its need to help facilitate critical thinking.[15] Edgington (1994) outlines a Critical Thinking Module as part of the University of Alberta dental hygiene curriculum on interpersonal relationships between practitioner and the client.[16] Williams et al. (2003) likely are the hallmark dental hygiene group to begin to look at critical thinking in dental hygiene as a measured skill or competency.

In general, there are several definitions of critical thinking, resulting in confusion and a challenge to select a definition for anyone who is not a "philosophy expert." (This should come as no surprise in view of the fact that an expert panel on thinking defined critical thinking only in 1990 through a rigorous Delphi Method.) It may be fair to state that unless an individual has studied philosophy, as have Socrates, Plato, Aristotle, and more contemporary persons such as Facione and the panel of experts, then most of us use a term whose "true" meaning we do not really know, philosophically speaking, yet we must possess the ability as part of our professional responsibility.

There are several definitions of critical thinking, resulting in confusion and a challenge to select a definition for anyone who is not a "philosophy expert."

Nursing appears to be actively investigating critical thinking in their profession. For those authors of the 997 nursing articles, it becomes readily apparent in their preambles that they must first search for the meaning of critical thinking, this thinking that is an expectation of nursing practice and the dental hygiene profession. Before being able to conduct their study, the initial challenge was finding and/or choosing a working definition. If the author was familiar with the American Philosophical Association they may have immediately sought this source, but if they were not (like this author) they struggled and became frustrated while rooting for a definition of a competency/ability supported by their profession.

The frustration is universal enough for us non-philosophers. Turner (2005), demonstrating critical thinking skills and the disposition to engage in critical thinking, dealt with the frustration by conducting a concept analysis on the term critical thinking as it was being used in nursing.[17] She carried out a computerized database search of CINAHL, Medline, and EBSCO from 1981–2002 using the keyword "critical thinking." The time period was selected based on the appearance of the term in the nursing literature (the paradigm shift in action). Facione's work with the expert panel[6] was the most heavily referenced, although the work of Paul (1995)[9] was also widely recognized. Turner concluded that critical thinking as it is used by the nursing profession has yet to reach conceptual maturity as a concept.

The concept has many surrogates, such as clinical judgment, clinical decision making, and diagnostic reading.[17] Similarly, in dental hygiene, Williams et al. (2003)[13] view critical thinking (which in their work is based on the APA source, that is, Facione's[6]) as subsumed within the clinical reasoning process. Turner reports that, in order for a concept to reach maturity (basing this on concept analysis literature), it must be well defined with clearly described characteristics, boundaries, preconditions, and outcomes.[17] It may be that the nursing profession, and likewise the dental hygiene profession, have to do what the APA expert panel did for critical thinking: arrive at a consensus of a working definition of critical thinking, an ability expected of both professions.

The wonders of inquiry: no sooner has the thought been posed or the question been asked than someone sought to answer it. Scheffer and Rubenfeld (2000) have already brought together a panel of nursing experts to arrive at consensus on critical thinking.[18] As with the APA expert panel (Facione 1990), they too used the Delphi Method, involving 72 participants from 9 countries. The nursing panel concluded critical thinking to be an essential component of nursing. They viewed it is one of ten habits of the mind (creativity, intuition, reflection, contextual perspective, confidence, flexibility, intellectual integrity, open-mindedness, perseverance, and inquisitiveness) involving the cognitive skills of analysis, application of standards, discrimination, information seeking, logical reasoning, prediction, and transformation of knowledge.

Fesler-Birch (2005) applauds the nursing groups' accomplishment but questions the use of the concept universally throughout nursing—indeed, if the profession is even aware of the consensus agreement.[19] Turner's (2005) concept analysis of the term supports Fesler-Birch's statement; critical thinking as a truly understood ability is still maturing as a concept for "common folk." For the dental hygiene profession, it may be postulated that although the concept is used, many dental hygienists would not be aware of its meaning, attributes, or its utility to the profession and self (similar to Fesler-Birch's comment for nursing).

Paul and Elder (2005) propose information literacy as a dimension of critical thinking.[20] Information literacy means having a working understanding, for example, of the knowledge, theories, principles, models, and skills within a discipline or profession. If dental hygienists must be critical thinkers, then part of that ability is to know what critical thinking is, possess information literacy on the concept. Paul and Elder, reputable philosophers on critical thinking, encourage asking questions in relation to the discipline (profession) and all its parts. (They time travel and sit with Socrates, inviting the Socratic method of questioning.) Basic to critical thinking is having the ability and desire to ask questions and being able to pose the question so that the understanding of it and its answer demonstrate the interconnectedness of the content and context. They state that knowing and realizing the relationship between the parts and the whole are integral to developing critical thinking skills.

An example to illustrate the "parts and the whole" of critical thinking: The "new" way to cover your mouth when you sneeze or cough is to use your sleeve.[21] If you cough into your hand, use a tissue and dispose of the tissue. As a public health measure, will coughing into your sleeve lessen the transmission of disease compared with coughing into your hand? If you use a tissue, how do you not touch the tissue (which is porous) and expose your hand to the infected tissue? What is the principle behind either/or? Has a study shown one more effective than the other? In reality, does a sleeve now not serve as the reservoir for infectious agents, given the sleeve is now a moist surface due to the cough or sneeze? This example illustrates the provocative line of questions, one question begetting the next question, and so on. Asking logical questions, with purpose or intent of truth-seeking, means one is information literate and can think about the next question. The act of thinking involves a purposeful self-directed process to gather information, knowing what is known and what is not known to the thinker, using concepts and principles, making inferences and assumptions, considering implications and the point of view.[20]

A "SIMPLE" EXAMPLE OF CRITICAL THINKING

Gregory (1991) asks how to encourage normally intelligent people to consider a problem and manage it through critical thinking.[12] He suggests the individual examine the evidence (like Plato) and learn to question the obvious and the-less-obvious (like Socrates) to arrive at a testable hypothesis, and then test it/observe the outcome (like Aristotle). True to critical thinking, Gregory suggests using simple questions, such as: "What does the experience have to do with me?" "Do I have all the information I need?" "Is there another view?" He suggests that critical thinking is a combination of fact (objectification), values (reflection), the structure of any given situation (interpretation), and recognition of choice (decision). Stanfield (2000) states that objectifying, reflecting, interpreting the information, experiences, feelings, and values are part of the process of arriving at a good decision.[22] Gregory discusses Dawes' (1988)[23] thoughts on the difference between deciding to "decision think" rather than "automatic think." Decision thinking requires attention and active participation. Automatic thinking is as it states, thinking with no active thought. Perhaps this is what Socrates warned us of when thinking: "beware of doing (thinking) so without suspension of critical thought," that is, keep at the forefront you are engaged in thinking—you are an active participant in your own thinking.

An illustration of "decision thinking" relevant to the dental hygienist is as follows. Standard practice for universal precautions is to wear gloves; however, this standard is only about 20 years old. Why didn't anyone think about this before? Surely, it only makes logical sense to glove the hand rather than use finger cots to cover noticeable lesions on the practitioner's hands. For how many years did dental hygienists (and other health professions) lean toward "automatic thinking" (learned from experience) until someone did some "decision thinking." To decision think, one needs to consider what is known or needed to be known, and be mindful of the personal impact on values—indeed, a need to address the role of "self" in the thinking process. In doing so, the person can then estimate the risk of the decision to both "reality" as it is defined by observation and to "self" as it is known to the person.

In the scenario above, as in most all scenarios, it is easy to propose decision thinking as an outcome of practising in an evidence-based manner. Know what is known—gather the evidence; but in doing so, do not forget to recognize the evidence in light of the situation and your "self." Twenty years ago, it was common practice to use finger cots to cover breaks in the skin integrity; gloves were for surgeons. Dental hygienists are not surgeons. As the world came to be more informed about infection control, appropriate practices followed. Having evidence is empowering, it fuels the ability to think critically. The habit of becoming an evidence-based practitioner promotes that practitioner to be a critical thinker; or perhaps it is the other way around, being a critical thinker enables the dental hygienist to establish an evidence-based practice.

Decision thinking requires attention and active participation. Automatic thinking is as it states, thinking with no active thought.

Competent dental hygienists are able to critically think. The following scenario illustrates this and was created after reading the CDHA Position Statement on Flossing.[24] The example is based on Recommendation 5: "Dental hygienists should be aware of personal biases towards 'traditional' oral hygiene aids, such as flossing, and aim to be more receptive to other aids and mechanical alternatives." Asadoorian (2006)[24] reports evidence that some dental hygienists recommend dental floss when other aids may better serve the client. Two other reasons for illustrating critical thinking using a "floss scenario" are as follows: (1) encouraging clients to floss (or remove interdental plaque) seems to be a common enough experience for dental hygienists; and (2) being so familiar an action to dental hygienists, the critical thinking process can be explored versus the context of the scenario. The scenario is replayed as it might be at the time of the client's appointment. Much of the evidence is understood to be evidence-based—it is fairly commonly understood to be so. The critique of the scenario with respect to critical thinking is based on the APA Report (1994) definition of critical thinking as the "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, inference, as well as the explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment";[6] and the Merriam-Webster Online Dictionary (February 2006) to define the skills identified in the definition.

Figure 1. Finding out the real problem

Jennifer Smith, 19 years old, presents with gingivitis and is otherwise in good oral health. Interdentally, the gingival tissue is inflamed but still fills the embrasure space. This has been her clinical situation for the last two years. At past dental hygiene appointments, she has repeatedly demonstrated manual dexterity in using floss but just hasn't adopted this oral hygiene habit on a daily basis, stating "I know I should floss. I know it works—I've tried it and I can feel the difference it makes. I just can't keep it up…I mean I know I can, but I won't." "You can, but you won't" paraphrases the dental hygienist and Jennifer replies, "I don't like to…" "You don't like to…," gently says the dental hygienist. "I don't like putting my hands in my mouth and that's why I won't floss," declares Jennifer. "Ahh, so it's about putting your hands in your mouth. I wonder…have you ever seen this [shows her the floss wand]…it can be a helpful tool to flossing…" [and the dental hygienist continues with the 'lesson' on the floss wand].

The dental hygienist who is thinking critically first must interpret what Jennifer is telling her, analyze what the issues are surrounding the information (see figure 1), evaluate the significance of the situation, infer some possibilities or realities, and explain how the evidence, concepts, methods, and criteria meld in the context of the situation. Table 1 outlines the critical thinking skills (and their definitions) in the context of Jennifer's presented need and the dental hygienist critically thinking about her need. Why does the dental hygienist spend the time and effort in determining Jennifer's need? Why is she intent on helping her? Why consider so many variables (bacterial biofilms, communication skills, behaviour modification principles, etc)? Part of being a good critical thinker is being willing to be one, to be disposed to the task, and to possess the critical thinking spirit.

Cognitive skills of critical thinking (Facione, pp. 7-12)[6]
Interpret – To comprehend and express the meaning or significance of a wide variety of experiences, situations, data, events, judgments, conventions, beliefs, rules, procedures or criteria
Analyze – To identify the intended and actual inferential relationships among statements, questions, concepts, descriptions or other forms of representation intended to express beliefs, judgments, experiences, reasons, information, or opinions
Evaluate – To assess the credibility of statements or other representations which are accounts or descriptions of a person's perception, experience, situation, judgment, belief, or opinion; and to assess the logical strength of the actual or intend inferential relationships among statements, descriptions, questions or other forms of representation
Infer – To identify and secure elements needed to draw reasonable conclusions; to form conjectures and hypotheses; to consider relevant information and to educe the consequences flowing from data, statements, principles, evidence, judgments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation
Explain the • Evidence • Concepts • Methods • Criteria • Context
Self-regulation – Self-consciously to monitor one's cognitive activities, the elements used in those activities, and the results educed, particularly by applying skills in analysis and evaluation to one's own inferential judgments with a view toward questioning, confirming, validating, or correcting either one's reasoning or one's results

Table 1. Six core cognitive skills of critical thinking* and dental hygiene scenario involving Jennifer and dental flossing

	Merriam-Webster online definition	**Dental hygiene practice** (examples only)
	1. to explain or tell the meaning of: present in understandable terms 2. to conceive in the light of individual belief, judgment, or circumstance: CONSTRUE	• Bacterial biofilms (dental plaque) exist on the tooth surface, including interproximal surfaces. Everyone has it. • The film matures daily and can become pathogenic to the tooth and surrounding tissues. • Tooth brushing removes the biofilm from lingual and buccal tooth surfaces, but does not do so for interproximal surfaces. • Dental hygienists recommend daily interproximal deplaquing. • Tools are available for removal of plaque interproximally, for example, dental floss • Flossing requires manual dexterity. • Most people have not adopted flossing as a daily oral health behaviour.
	1. to study or determine the nature and relationship of the parts of by analysis	• Disruption of the biofilm structure every 24 hours keeps the pathological factor at a low level. • Jennifer knows she has gingivitis and she knows it is treatable and preventable with good oral hygiene, including interproximal deplaquing. • She does not use anything to clean between her teeth, just regular tooth brushing. • Behaviour modification is a challenging task for most of us. • Jennifer needs to deplaque her tooth surfaces.
	1. to determine or fix the value of 2. to determine the significance, worth, or condition of, usually by careful appraisal and study	• Dental floss mechanically disrupts the bacterial biofilm structure, but other interproximal aids are also effective. • Simply telling Jennifer to floss will not likely lead her to do so as she has proven. • Paraphrasing her statement, "I know I can, but I won't," may lead to understanding her position. • Interproximal tools such as floss wands have been shown to be effective and don't require placement of the hand in the mouth.
	1. to derive as a conclusion from facts or premises	• If placing her hand in her mouth is the reason she doesn't use floss, introducing the floss wand may be a realistic suggestion.
	1. a: to make known b: to make plain or understandable 2. to give the reason for or cause of 3. to show the logical development or relationships of intransitive senses: to make something plain or understandable	Evidence: Jennifer has had gingivitis for a couple of years. She has tried to floss but hasn't been able to sustain the habit, though she knows it works for her if she does it. Concepts: Dental plaque is a potentially pathogenic biofilm. Behaviour modification theory supports knowing the client's perspective. Methods: The dental hygienist, using effective communication skills, helps Jennifer determine the real reason she doesn't floss—she doesn't like to put her hands in her mouth. Criteria: Remove dental plaque from interproximal surface. Recommend a 'do-able' habit. Context: Given the real reason and knowing the floss wand can be effectively used to remove plaque, the dental hygienist suggests this tool to help Jennifer adopt an important oral hygiene behaviour.
		"Jennifer represents the majority of my clients. Most people don't want to floss even though they may be able to do it. They seem to know the reason to do it but haven't been able to adopt the behaviour. Evidence suggests there are other ways to deplaque the interproximal tooth surface. I will look into those before recommending an alternative to my clients."

"Critical thinking is a purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, inference, as well as the explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment was based" (Facione's Delphi Report Definition1990).[6]

THE QUESTION: HOW DOES THE DENTAL HYGIENE PROFESSION DEFINE CRITICAL THINKING?

This article has been a struggle to write, as I am a self-professed "common folk," resisting the urge to walk away from this critical think on the ability to critically think as an expected competency of my chosen profession. It may be easier to be a lazy thinker on this task than to self-direct the quest to know the concept and its meaning in the dental hygiene profession. Have you yet asked yourself, "What do I mean by critical thinking? Do I critically think as a dental hygienist?" To be a critical thinker, you have to ask these questions. You have to be able to productively seek the answer—and want to.

The challenge presented to the dental hygiene professional community is to digest the concepts, principles, theories, and models embracing critical thinking. It is a discipline of its own, yet a process our profession professes as an ability or competency. Once we confirm we are information literate about the concept then we can, as a community, create a working definition of critical thinking for our profession. When the profession arrives at a consensus definition, then as individuals, dental hygienists can critically think if they are indeed critically thinking as part of quality care for each and everyone of their clients.

The reason for this exposition—an investigation into the meaning of critical thinking and its use in dental hygiene practice—has led to a few propositions for further dialogue and hopeful creation. They are as follows:

1. Arrive at a professional consensus of the meaning of critical thinking in the dental hygiene profession and do so using a Delphi Method as was done by the American Philosophical Association and the nursing profession.
2. Develop a "dental hygiene" model for critical thinking.
3. Assess the critical thinking skills and critical thinking disposition of dental hygienists and students of the profession.
4. Identify the calibre of critical thinking teaching strategies in relation to student performance in the undergraduate dental hygiene curriculum based on the formally established professional consensus, and follow the graduate's development throughout their career. This can also be applied to quality assurance mechanisms for the profession.

Imagine a group of dental hygienists from across the country gathered around an oak table in a room filled with light. They are thinking, actively doing so as a living thing. Evident in the room are people purposefully and diligently engaged in discussion, each able to recognize his or her own biases and need for more information. They sense they are close to arriving at a consensus of the meaning of critical thinking in the dental hygiene profession. The image is good.

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Foreign Body Gingivitis: A Literature Review

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ABSTRACT

Foreign body gingivitis (FBG) is a desquamative gingival condition that is associated with foreign material embedded in gingival tissue. It is an unusual but not rare condition most often occurring in females. It is commonly misdiagnosed clinically as a bacteria-induced periodontal condition or autoimmune disease. FBG generally presents as localized gingival redness, edema, ulceration, marginal-to-diffuse inflammation, and sometimes hyperplasia. Symptoms can include burning or pain. A biopsy is required for a definitive diagnosis of FBG so that appropriate therapy can be administered. Often mistaken for oral lichen planus (OLP), FBG lesions are more localized, involving the gingiva especially in the anterior and possibly affecting interdental papillae. Unlike OLP, FBG lesions do not typically respond to topical steroids. Treatment and prevention are key factors in controlling FBG. Possibly because there are very few articles published on this condition, there is a lack of diagnosis and reporting of FBG by dental clinicians.

Keywords: foreign bodies; gingivitis; lichen planus, oral; periodontal diseases

BACKGROUND

Daley and Wysocki (1990)[1] were the first to document cases of non-microbial gingivitis that appeared to be associated with inorganic foreign materials, other than amalgam, embedded in gingiva tissues. Eight cases of foreign body gingivitis (FBG) exhibiting clinical characteristics were studied in an attempt to determine the source of foreign material through identification of familiar elements. Stained tissue sections from eight cases of granulomatous gingivitis were examined microscopically and by polarized light microscopy to determine the presence of foreign material. Detailed clinical histories from all cases were obtained and two patients were clinically examined. Serial tissue sections were examined by scanning electron microscopy and energy-dispersive x-ray microanalysis (EDXM). Control samples examined by EDXM included five focal fibrous hyperplasias from five age-matched patients, sections of paraffin before and after deparaffinization, and ten samples of dust from the laboratory in which samples were prepared for EDXM. The report identified eight patients with non-microbial gingivitis in maxillary anterior segments, presenting as red or red and white macules and involving both free and attached gingiva. The inflammation was more severe in interdental papillae areas and mandibular gingiva. The condition persisted for up to two years despite professional therapy and reasonable patient homecare.[1]

FBG cases accounted for 0.3% of total biopsies received between January 1, 1988, and November 30, 1994, at the University of Western Ontario Pathology Department. This percentage represents a minimum estimate of clinical incidence of this disorder, as there is probably a general lack of diagnosis and reporting of FBG by dental clinicians. Because of this, many cases are not biopsied or treated.[1]

Most dental procedures incorporate the use of restorative abrasive agents, including disks, stones, or burrs mounted on slow-speed handpieces, steel or diamond burrs on high-speed handpieces, abrasive strips, polishing compounds, or air abrasives. Dental procedures may result in abrasion or cutting of the gingiva, allowing dental materials to be introduced into gingival connective tissue. Daley and Wysocki[1] reported the onset of multifocal lesions in a 44-year-old female patient shortly after a dental hygiene student had carried out a dental prophylaxis on her. Another patient noticed the onset of lesions after placement of a full dental crown; a third had a lesion occur adjacent to the clasps of a removable partial denture.

An amalgam tattoo is a more common presentation of a dental material introduced into oral soft tissue.[1-4] Most common sites are gingiva, alveolar mucosa, and buccal mucosa whereas FBG is limited to the gingiva. Amalgam tattoos contain pigmented fragments of metal within connective tissue. The response to amalgam appears to be related to its particle size and elemental composition. Unlike FBG, fragments are encapsulated by dense fibrous connective tissue and mild or no inflammation can be detected. The fragments can be detected radiographically as radiopaque.

Other localized exogenous pigmentations can be the result of intentional embellishment or accidental tattoos. This may be due to a cultural practice of East African tribes or seen in inmates from correctional facilities. Materials may include pen ink, coal, metal dust, and pencil graphite.[4] Trauma may also result in various foreign mate-

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RÉSUMÉ

La gingivite causée par un corps étranger est une affection gingivale desquamative qui est associée à un matériau étranger inclus dans le tissu gingival. C'est une affection qui, bien qu'inhabituelle, n'est pas rare et elle survient le plus souvent chez les femmes. Elle est fréquemment mal diagnostiquée comme une affection gingivale causée par une bactérie ou une maladie auto-immune. Dans un cas de gingivite causée par un corps étranger, il y a présence de rougeur gingivale, œdème, ulcération, inflammation marginale à diffuse et, quelques fois, hyperplasie. Les symptômes peuvent inclure une sensation de brûlure ou de la douleur. Une biopsie est nécessaire pour établir un diagnostique définitif de gingivite causée par un corps étranger afin que le traitement approprié puisse être administré. Souvent prises à tort pour un lichen plan buccal, les lésions de la gingivite causée par un corps étranger sont plus localisées, notamment sur la gencive antérieure et, possiblement, sur les papilles interdentaires. Contrairement au lichen plan buccal, les lésions de la gingivite causée par un corps étranger ne répondent pas bien aux stéroïdes topiques. Le traitement et la prévention sont des facteurs-clés dans le contrôle de la gingivite causée par un corps étranger. Possiblement parce qu'il y a très peu d'articles publiés sur cette affection, il y a un manque au niveau du diagnostic et de la déclaration de la gingivite causée par un corps étranger de la part des cliniciens dentaires.

rials becoming lodged under superficial skin layers causing colour changes. These foreign materials are inert in the tissue and do not appear to cause inflammatory responses such as those that elicit FBG.

FBG also needs to be differentiated from a surface or contact tissue response to an allergen. Most sensitivities to dental materials are allergic reactions, presenting as either contact stomatitis venenata (an allergic condition of the oral mucosa resulting from contact with a substance to which the individual is sensitive) or systemic allergies.[1,3] Stomatitis venenata may manifest in the oral cavity as mucosal burning, swelling, ulceration, erosions, or gingivitis-like lesions. This tissue reaction resolves when the surface irritant is removed and no foreign material is present within the tissue.

CLINICAL PRESENTATION AND SYMPTOMS

Clinical features of FBG include localized change in gingival colour (bright red to bluish red), edema, ulceration, and marginal-to-diffuse inflammation (see figure 1). The tissue is erythematous or leukoplakic (red or red/white lesions) and may be hyperplastic or hyperkeratotic. Interdental papillae are usually affected with edematous as well as erosive patches. Burning or pain may accompany the lesion(s). The moderate-to-intense discomfort that the FBG patient may experience is due to inflammatory response and can be identified histologically. If raised lesions are present, they may be traumatized by general oral function or oral hygiene care and become secondarily hyperkeratotic in nature. Lesions may involve mandibular or maxillary gingiva, beginning at the free gingival margin, and may extend to attached gingiva in anterior and/or posterior regions with a prevalence tending toward the anterior regions.

ETIOLOGY

A portal of entry for foreign materials may be created by gingival trauma that may be self-induced (such as toothbrush abrasion) or be the result of a periodontal procedure (such as scaling and root planing) or restorative treatment. Inadvertent or intentional curettage may occur as a result of such professional procedures, leading to damage of the gingival epithelium.[1-3,5]

Figure 1. Initial presentation with significant gingival erythema, loss of interdental papilla, and marginal ulceration. Reproduced with permission from the following article: Gravitis K, Daley TD, Lochhead MA, "Management of patients with foreign body gingivitis," J Can Dent Assoc, 2005;71(2):107

Oral mucosal ulcerative conditions, such as herpetic lesions, may expose connective tissues, thus allowing foreign body contamination and subsequent inflammatory response. Gingivitis and periodontal disease may permit foreign matter to enter tissue due to ulcerative or desquamative conditions and poor integrity of the gingival sulcus.[1-3,5] Other oral pathologies that may provide possible routes for material introduction include infection, vesiculobullous disease, oral lichen planus (OLP), benign mucous membrane pemphigoid, and pemphigus because the gingival epithelium that normally acts as a barrier has been compromised in these conditions.

DIAGNOSIS AND HISTOLOGY

FBG is often clinically misdiagnosed prior to biopsy as oral erosive lichen planus, benign mucous membrane pemphigoid, pemphigus, fibroma, peripheral ossifying fibroma, pyogenic granuloma, hyperkeratosis dysplasia, papilloma, verruca vulgaris, leukoplakia, gingivitis, periodontitis, herpetic or aphthous ulcers or candidiasis.[1-2] Because of this, clinical diagnosis alone is not sufficient. It is imperative that a biopsy be performed to achieve a definitive diagnosis before appropriate treatment begins.

	Foreign body gingivitis	Oral lichen planus
Etiology	• Potentiated by inorganic foreign materials • Gingival trauma and or inflammation may allow access of foreign substance	• Autoimmune disease • May be affected by oral medications or proximity to dental amalgams[6,7]
Histology	• Biopsy needed for diagnosis • Can resemble OLP microscopically • Presence of inorganic foreign materials	• Confirmation of OLP should be made by means of biopsy • No inorganic foreign material present
Clinical appearance	• Localized change in gingival colour (bright red to bluish red) • Marginal to diffuse inflammation • Desquamative gingival tissue • Hyperplastic or hyperkeratotic • Erythematous/leukoplakic appearance (red or red/white lesions); often mistaken for OLP • Lesions are stationary	• Reticular-oral lesions appear as interlacing white striae with an erythematous border; commonly found on buccal mucosa, buccal vestibule, tongue and gingival • Desquamative • Erosive OLP – erythematous ulcerations that tend to migrate over time • Lesions may migrate
Symptoms	• Burning or pain may accompany lesion • Most lesions are present for a "short period" before a client seeks professional consultation due either to pain or aesthetic concerns • Lesions do not disappear or remit	• May be asymptomatic or have burning sensation • Mucosal sensitivity to hot or spicy foods and sour fruits • Symptoms may spontaneously disappear with periods of exacerbation and remission
Age/gender tendency	• Mean age is 48 years • Frequently in ages 41 to 50 • Higher prevalence in females • FBG may be exacerbated by hormonal influences	• Mean age is 49 • Frequently in ages 30 to 707 • Occurs more frequently in females • No hormonal influences
Treatment	• Surgical management – gingivectomy or free gingival graft for hyperplastic or atrophic areas • Monitoring of changes to limit further periodontal tissue damage • Not typically responsive to topical steroids • Frequent and thorough professional instrumentation to control plaque and calculus to reduce contributing inflammation;[8] specific home care instructions tailored to specific needs[5]	• Free gingival grafts can be used for atrophic sites[7] • Management of symptoms and monitoring for dysplastic changes • Reticular types are asymptomatic; no treatment required • Erosive types typically respond to topical steroids • Good oral hygiene is essential and can enhance healing; plaque and calculus associated with a significantly higher incidence of erythematous and erosive gingival OLP lesions[6,8]

Table 1. Foreign body gingivitis and oral lichen planus compared

FBG should be included in differential diagnosis of a lesion that resembles OLP clinically (see table 1) or other ulcerative-immune mucosal conditions. However, FBG may resemble OLP not only clinically but also microscopically, with a band-like inflammation infiltrate underlying an alternately acanthotic and atrophied keratinized epithelium.[2-3] Focal degeneration of the basal lamina layer may be present in both lesions.[3,6] The fundamental histologic difference between the two is the absence of foreign material in OLP. They differ clinically in that FBG is generally limited to the gingiva and does not typically respond to topical steroids. OLP, on the other hand, may be widespread (inclusive of some or all oral tissues) and may include migrating mucosal involvement.[6-10] Topical steroids have been shown to be most predictable and effective for controlling signs and symptoms of OLP. Since topical steroids are largely ineffective for FBG, this fact may support a clinical diagnosis of FBG.[7]

Gordon and Daley included all cases diagnosed as FBG from January 1988 to November 1994 by the Oral Pathology Diagnostic Services of University of Western Ontario.[2] Age-matched cases of chronic, hyperplastic, and subacute gingivitis diagnosed during that time served as controls. As some cases of FBG are granulomatous, all cases diagnosed as granulomatous gingivitis during that time period were also examined as controls. Cases diagnosed microscopically as amalgam tattoo were not included in the study. All tissues were subjected to routine diagnostic procedures before initial diagnosis. Test and control cases were pooled and examined without reference to original diagnosis. One hematoxylin-eosin stained slide of each case was reviewed by light microscopy and polarized light

when necessary. This served as a double check of the original diagnosis and a reliability test of the proposed diagnostic criteria. The criteria for diagnosis in the blinded light microscopic examination included presence of chronic inflammation in the gingival specimen, the presence of foreign bodies in an area of inflammation, and consistent localization of foreign bodies in at least two serial tissue sections. Sixteen cases were randomly selected for staining to rule out deep fungal or mycobaterial infection. To reduce diagnostic bias and to achieve the highest possible level of diagnostic certainty, only cases both originally and blindly diagnosed as FBG were included. The majority of diagnosed cases of FBG in this study were female.[2] Gingival inflammation in women may be exaggerated during pregnancy and while taking oral contraceptives and hormonal replacement therapy. This occurs because these conditions/medications may exacerbate inflammatory response. Hormonal influences, therefore, may play a role in gender discrepancy for diagnosis of this condition in females.[2]

Energy-dispersive x-ray (EDX) is an effective research tool for the microanalysis of tissue biopsies; material in biopsies can be compared to a number of common dental restorative, dental hygiene, and home-care products in an attempt to identify specific foreign elements or compounds.[1-3] Gordon and Daley[3] pooled cases with an age-matched control group of 44 cases of chronic, subacute, and hyperplastic gingivitis and 3 cases of granulomatous gingivitis. These were subjected to blind diagnosis. Only cases that were diagnosed as FBG in original and subsequent diagnosis were used for further study. Controls were not subjected to EDX examination, which required microscopically identifiable particles as subject for the analysis. Each tissue sample was examined on the same scanning electron microscope. The foreign body location was identified grossly with reference to tissue section. The foreign bodies were identified by backscatter detection to enable surface particles that could be contaminates to be distinguished from particles located deep in the tissue. Particles located only superficially or not in the area of inflammation were noted on light microscopy and were rejected for further examination. The particles were then subjected to EDX. All tissue analyses were performed by one examiner. Clinical, microscopic, and EDX data were analyzed and examined for association with a data-based program. Dental materials were examined on one of two electron microscopes. To compare atomic analysis of FBG to those of dental materials, similar materials (that is, prophy pastes, polishing strips, polishing disks) were grouped and their total atomic composition was compared with that of each specimen in an attempt to find a match.[3]

"It is difficult to prove an iatrogenic cause based on elemental constituents alone. However, the combined historical, clinical, histological, and EDXM features provide sufficient information on which to draw conclusions."[1] In 28 of 61 cases, there was a match between elements in foreign material (found by EDX) in the tissue and those in a specific class of dental materials.[3] In 21 of 28 cases, there was a match indicating that the material was abrasive.[3]

TREATMENT AND PREVENTION

A critical assessment of hygiene status, particularly subgingival deposits and root roughness, is necessary for patients with FBG and other desquamative gingival conditions to reduce the contributing factors of inflammation. "When oral hygiene measures are complicated by pain and bleeding, inferior plaque control is inevitable. This must be counteracted by more thorough and frequent professional instrumentation, as well as oral hygiene measures tailored to the client's specific requirements."[5] Extensive scaling, root planing, or curettage should not be followed by a coronal polish in affected active areas. Selective coronal polish can be performed at periodontal maintenance appointments using a low abrasive polishing paste at sites with healthy proximal tissues.

Clients with gingival ulcerations should be advised to avoid abrasive dentifrices including tartar control,[5,8,11-17] whitening,[12,13,17] and other potentially irritating compounds (sodium lauryl sulfate,[5,14,16,18] and triclosan[5,11,14-16]) formulas at home. Mouth rinses with high alcohol content should also be avoided to minimize tissue desiccation and chemical irritation. Deplaquing may be performed with a soft toothbrush and water alone if oral lesions or ulcerations are present.[5] A chlorhexidine rinse may be helpful for active sites if soreness precludes other hygiene modalities.

Until recently, recommended definitive management for FBG has just been surgical excision of the affected area (gingivectomy). A free gingival graft procedure has been recommended in a recent publication, "Management of Patients with Foreign Body Gingivitis: A Report of 2 Cases with Histologic Findings."[5] (See figure 2.) Clinical findings and treatment histories of two patients were discussed in the case presentations dealing with affected sites that are fragile and prone to gingival recession.[5] Tissue grafting may be necessary for either symptom relief or esthetic purposes. Regular monitoring of affected sites is important so that timely treatment can be provided. The use of short-term topical steroids may provide temporary relief from discomfort if a lichenoid type of inflammation is present.[5,7,10]

Figure 2. After root planing and free gingival grafts for teeth 21 and 22. Reproduced with permission from the following article: Gravitis K, Daley TD, Lochhead MA, "Management of patients with foreign body gingivitis," J Can Dent Assoc, 2005;71(2):107

Care must be taken during professional- or client-administered oral procedures to avoid causing gingival trauma that might create a portal for foreign materials. Care should be exercised when placing and trimming restorative margins or removing existing restorative materials. A rubber dam should be used during restorative procedures when inflammation or ulceration is present in the tissue in the restorative area. The use of air abrasion procedures should be avoided if gingiva is highly inflamed or eroded.[5,18]

SUMMARY

FBG is caused by the impregnation of certain irritating foreign materials into the oral mucosa resulting in a foreign-body immune response. Gingival trauma, self-induced or resulting from a professional dental procedure, may damage the oral epithelium, allowing a portal for foreign materials such as dental resins or polishing compounds. Care must be exercised when working around oral tissues, especially when oral epithelium has been damaged and connective tissue exposed. Because treatment options are limited, prevention is important.

Clinically, FBG (without a biopsy) can be confused with erosive lichen planus, benign mucous membrane pemphigoid, pemphigus, gingivitis, as well as other desquamative gingival disorders. Biopsy and microscopic evaluation to show foreign materials in the tissue is needed to make a definitive diagnosis.

Clients with FBG require specific dental and periodontal management that is aimed at minimizing further tissue trauma and keeping other local irritants, such as plaque and calculus to a minimum. Periodontal surgery may be needed for treatment of atrophic or hyperplastic areas. Specialized individual oral home care is important and regular monitoring of these area(s) is important to prevent further breakdown of the gingival tissues.

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Building Relationships *(continued from page 283)*

together to provide the best client-centred care possible. Synergy in CDHA is represented by the will and input of its members supported by the board, executive director ,and staff. The board articulates and focuses its ends and goals as given by the membership. It is these relationships that have made the growth of this organization possible. CDHA is a good example of the results that can be achieved when all parts appreciate the other's strengths and desires and work together to move ahead.

When you attend CDHA national conferences, you have the opportunity to practise synergy by networking with other dental hygienists and discussing common challenges in our profession. There are various activities that encourage discussion and feedback. Currently, CDHA is taking the feedback you gave at the Town Hall Meeting in Ottawa in 2005 as well as membership feedback in Edmonton in 2006 to change the organization and meet your needs. I encourage you to continue to take advantage of these opportunities to build your own personal relationship with CDHA and let your voice be heard. In the next year, I look forward to hearing from you and meeting you personally as we host the IFDH (International Federation of Dental Hygienists) conference in Toronto in July 2007. It will provide yet another opportunity to build relationships with dental hygienists from Canada and around the world.

You can contact the president at <president@cdha.ca>.

Rewards of Challenges *(continued from page 287)*

"research is only one component of evidence-based decision making." As a counterbalance to this point, she also notes the human phenomenon of resistance to change that many of us have regarding long-held beliefs. I had hoped to publish both the member's letter and the author's response to further the dialogue. However, the member unfortunately did not feel comfortable with such a public presence.

The member's discomfort led me down a further stream of thought. It is a normal reaction to dislike any perceived conflict and to try to avoid it. Rather than use a broad brush to suggest all conflict is negative, I would like to propose that we think of some conflict as a very positive expression of critical thinking. I agree that sometimes conflict does rob us of energy as we try to cope. However, at other times, we can experience a positive charge if we reframe the conflict as a learning experience. Sometimes a challenge to long-held beliefs creates an opportunity for growth.

I am reminded of the story of four generations of women who cooked a Thanksgiving ham. The young daughter asked her Mom why she cut the end off the ham before putting into the roasting pan. The mother said she didn't know; she had learned it from her mother who had always done it that way and so she called her mother. Her mother said the same thing—she had learned it from her mother and in turn called her. The great-grandmother of the little one who started the critical questioning told her daughter that she had done it because it was the only way the ham would fit into her roasting pan. There are few sources that we consider more credible than our mothers, yet in this light-hearted example, we can see how traditional thought is central to our belief systems.

Critical thinking can sometimes take us to an uncomfortable place. Conflict can often emerge as new ideas challenging what we consider common sense. Asking questions is a good thing, but being open to answers is also a good thing. As the Chinese proverb says, "The gem cannot be polished without friction, nor man perfected without trials." As we evolve the body of knowledge that defines dental hygiene I invite you all to take an active role and question and comment as many of our members have with respect to what you read in these pages, on our website, and in specific consultations. I also invite you to be open to the responses that you receive. You don't have to like them but give them some critical thought.

In closing, I want to thank all of you personally who take the time to provide us with feedback for what we do well and for what we don't do well. I appreciate your taking the time to help your association grow and thereby help the profession evolve. I also wish to thank Ms. MacDonald for raising an issue that many of us take for granted and to help us look at it with critical eyes.

Best wishes for a happy holiday season and cheers to an exciting New Year.

Dental Hygienist Occupation Badge

Dental Hygienists Celebrate 50 Years of Service in the Canadian Forces Dental Services

by Marina Roberge, Master Warrant Officer, CFDS Senior Dental Hygienist

THIS YEAR IS AN IMPORTANT MILESTONE FOR Canadian Forces dental hygienists, both military and civilian—we are celebrating 50 years of service to military members. Dental hygienists have been an important part of the Canadian Forces Dental Services (CFDS) and of its predecessor, the Royal Canadian Dental Corps (RCDC), for five decades. As the Senior Dental Hygienist in the CFDS, I am pleased to write about dental hygienists' history in the unit and a bit about our job and how it compares with a civilian dental hygiene position.

HISTORY

Ret'd Colonel D.H. Protheroe, in his history of the Dental Corps,[1] described the 1956 introduction of dental hygienists into the service as one of the most important events in its history. He said that, without the contribution of the dental hygienists, it would have been impossible to initiate the very successful preventive dentistry program. Dental hygienists can be proud of their role in the provision of dental services to the military.

In 1956, the Royal Canadian Dental Corps employed the first two dental hygienists, Flight Sergeants P.E. Savage and C.M.B. Torrens, who had received their dental hygiene training in England. Sergeants R.H. Daw and H. Thorsson, the first two dental hygiene graduates from the Royal Canadian Dental Corps School, also joined the RCDC in 1956. The RCDC School was located in Ottawa until 1958 and then at Canadian Forces Base, CFDSS, Borden, Ontario, until 1993 when the Canadian Forces dental hygiene program was closed.

During the early years of the profession, dental hygienists were referred to as "Dental Technicians Clinical." Although the Technician Clinical course was extremely difficult, it was not accredited until years later because at the time, civilian dental hygienists received their training only through university programs.

The years between 1981 and 1986 saw the worst shortage of military dental hygienists since their incorporation in the CFDS and over 20 Direct Entry Dental Hygienists were enrolled in the Canadian Forces under the Direct Entry Program. This program was created and opened at Recruit Centers for only a few years in the 1980s in order to hire trained civilian dental hygienists who did not have to go to the CFDSS or RCDC Schools.

PRESENT-DAY STAFFING AND TRAINING

The number of dental hygienists has been downsized from 70 Military Dental Hygienists to 26 Established Positions, classified as a sub-occupation of the Dental Technician Occupation. Our small but vibrant team of 26 military and 50 civilian dental hygienists is assigned to 26 dental detachments (clinics) across Canada. (See figure 1.)

Advanced Training List—reassignment to the dental hygienists' specialty—is carried out through the two-year dental hygiene program in five Ontario Colleges: Algonquin College, La Cité Collégiale, George Brown College, Collège Boréale, and Georgian College. Dental technicians who meet the criteria for the program can apply through Dental Headquarters in Ottawa to be selected for the two-year accredited civilian dental hygiene program. Between one and five candidates are selected annually for this training.

Numerous civilian dental hygienists, full- and part-time, help the CFDS achieve its preventive dentistry goals. The civilian dental hygienists could be hired through a local employment agency or the Civilian Human Resource Office (CHRO) that exists on every military base.

MILITARY DENTAL HYGIENISTS COMPARED WITH CIVILIAN

Dental crest

The most obvious difference between military and civilian dental hygienists is the fact that we wear a military uniform. To distinguish ourselves among the 66,000 Canadian Forces members, we wear hat badges—the Dental Crest. We belong to the "Profession of Arms" as any other soldier as we are soldiers first!

The patients also differ quite significantly in the military and civilian environments. Dental hygienists in the civilian "world" see clients who range in age from children to the elderly and these clients pay for their oral care. The majority of CFDS patients are healthy adult males who do not pay for their dental services. The CFDS mission is to "ready the soldier," making sure that our military members are always dentally fit to deploy anywhere on short notice. We offer a universal standard of care for

[1] Ret'd Colonel D.H. Protheroe, *Forty years of progress, RCDC and CFDS*. Ottawa: National Defence; 1989.

Top: **Fig 1.** Winter Working Group in Trenton 2005. *L to R:* WO Cliff Gilholm,WO Anna Aldrich, WO Karen Nelmes, Sgt Melanie Tousignant, WO Carol Buxcey, MWO Marina Roberge, WO Linda White, Sgt Pattie Powell, WO Josée Dubois, Sgt Dean Squires. *Bottom:* **Fig 2.** Sgt Mélanie Tousignant, chairside, in June 2006.

all entitled personnel in all locations on a "24/7 access to care" basis. Every Canadian Forces member has a dental examination annually. A minimal acceptable fitness level must be reached and followed by a prophylaxis treatment.

The most obvious similarity between military and civilian dental hygienists is that, on a daily basis, we carry out the same duties as a chairside provider. (See figure 2.) The most obvious difference is that we may get a chance to be deployed on ship or on tour and operations. We also are posted everywhere in Canada or across the world, sometimes on short notice. We enjoy these challenges—they keep us interested!

WHY WE ENJOY OUR MILITARY CAREER

We are often asked about what keeps us in the CFDS as dental hygienists. Here are just a few reasons:

- *The "esprit de corps" among colleagues and civilian counterparts:*—We love the sense of family in our Dental Corps and we meet so many people over the years. Each dental hygienist is not only part of his or her individual clinic but also of a "national" clinic because of the standardized system we use (the same documents, policies, and procedures regardless of the location). We do attend special military functions such as Parades, Mess Dinners, Military Dental Conferences, and so forth. (See figure 3.)
- *Great opportunities for career progression:*—During a normal 25-year career, a military dental hygienist may expect to receive three to six promotions an average, depending on one's performance and potential.

Top: **Fig 3.** At the opening ceremony for the 50th anniversary celebrations, February 2006. L to R: WO Carole Buxcey, Sgt Pattie Powell, WO Trina Roberge, MWO Marina Roberge, WO Karen Nelmes. *Bottom:* **Fig 4.** WO Josée Dubois in Afghanistan, 2004.

- *Administrative responsibilities:*—We enjoy the fact that we can be involved with administrative responsibilities and tasks, for example, hiring dental hygienists and assistants and being in charge of the dental hygiene department in our clinics. We manage people, make policies that can improve the clinic, and have very good opportunities for managerial positions as leaders, supervisors, and middle management. We can tackle extra duties that we would probably not see in a civilian environment, such as temporary duty overseas or in isolated areas; physical training requirements; administration, finance, and secondary duties such as Unit Safety Officer, Unit Environmental Officer; all these within the dental detachment.
- *Travel:*— We can get to know our country better with all these opportunities to travel and also have the chance to move overseas. During a career, a military dental hygienist may expect an average of five to ten postings (moves) in order to fulfill Canadian Forces needs and requirements. We join to serve, not to be served! (See figure 4.)
- *Opportunities to contribute:*—Even after 25 years of service, we stay in uniforms because we believe that we still have a lot to offer the CFDS and that we can be a positive influence for our younger dental hygienists.

In conclusion, the theme of the 2006 CDHA Conference, "Endless Opportunities…Create Yours," is also what keeps us in the CFDS as dental hygienists—the endless opportunities that the Canadian Forces offer!

Sanitas in ore!

ABSTRACTS

The International Association for Dental Research (IADR), in association with the American Association for Dental Research (AADR), Canadian Association for Dental Research (CADR), and American Dental Educators Association (ADEA) held a combined meeting and exhibition March 8–11, 2006, in Orlando, Florida. Scientists and researchers from around the world present their research findings for discussion. The IADR has given us permission to publish a selection of abstracts presented at that meeting.

CLINICAL TECHNIQUES

1289 PREDICTING DENTAL HYGIENE CLINICAL SKILLS

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Much of dental hygiene curriculum for clinical instruction is focused on developing fine motor skills such as hand-to-eye coordination. The **objective**: to determine if instrumentation competency could be predicted utilizing educational methods taught in pre-clinical courses. **Method:** a carving exercise in Dental Morphology was averaged and compared to instrumentation scores in a pre-clinic techniques course and then further correlated to the students' averages on instrumentation competencies in Clinic I. Twenty-one students were assigned the exercise of carving to scale a maxillary permanent central incisor, as well as, a permanent mandibular second molar. The students were given step-by-step instructions, carving wax and carving instruments to complete the assignment. The averages of these scores were compared to a clinical instrumentation mid-term OSCE examination administered in the pre-clinical techniques course and to the final instrumentation OSCE which was administered in the same course. Upon completion of Clinic I, the scores on the student's two required instrumentation competencies (IC) were averaged and correlated to the above data. A linear regression was used to correlate the data. **Results:** R2 = .000 when using a linear regression correlating carving to the instrumentation competency (IC). When comparing the final OSCE to IC, R2 = .014 and when comparing the mid-term OSCE to IC, R2 = .317. The latter having the strongest correlation of the three groups of data. **Conclusion:** The pre-clinical mid-term OSCE had the most predictive value to instrumentation skills. Further research is needed to determine possible predictors for dental hygiene clinical skills. The opportunity to identify these predictors would enhance dental hygiene teaching methodology and would provide early identification of students needing additional clinical instruction.

1299 INFLUENCE OF TRAYS AND TECHNIQUES ON ACCURACY OF PVS IMPRESSIONS

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Objectives: To determine how tray rigidity and impression technique affect the accuracy of impressions made with an addition polymerizing silicone. **Methods:** Metallic rim-lock trays (M) and disposable plastic trays (P) were used in combination with three different impression techniques. The three techniques consisted of: 1) Heavy/light body materials in a one-step impression (HL), 2) Putty impression with 2 mm space and light body impression made in two steps (PS), and 3) Putty impression without spacer and light body impression made in two steps (PL). Ten impressions of each combination technique/tray were made of a master model. The master model included two steel abutments (44 and 47) and a steel rod placed at ridge level between the two abutments. Five marks had been placed on each steel abutment. One mark placed on the steel rod in between the two abutments served as reference point. By use of a universal measuring microscope, the x, y, z-coordinates were recorded for each of the 11 marks on the master model and the impressions. The distances between the different marks and the reference point were calculated and compared with the master model. Using a t-test and pair wise comparisons, significant differences ($p<0.05$) were found between 4 of the investigated groups and the master model. **Results:** All techniques (PL, PS and HL) used with the plastic trays had distances that were significantly different from the master model, while for the metal trays it was only the HL technique that resulted in a distance that was significantly shorter than the matching distance on the master model. **Conclusions:** Plastic trays produced less accurate impressions than metal trays. When metal trays were used, putty based impressions were dimensionally better than heavy /light body impressions. Consequently, tray rigidity and maximal rigidity of the bulk of the impression improved impression reliability.

SALIVA

1049 PROTECTIVE ROLE OF GREEN TEA IN SJOGREN'S SYNDROME ANIMAL MODELS

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Sjogren's syndrome (SS), an autoimmune disorder involving atrophy of the salivary glands. The etiology is not completely understood, but involves autoantigen presentation leading to development of autoantibodies. It may also involve apoptosis. In contrast to the U.S., the prevalence of xerostomia is significantly lower in green tea-consuming countries such as China and Japan. Green tea polyphenols (GTPs) are major bioactive components of green tea. **Objectives:** to investigate in vitro and in vivo the potential role of GTPs in modulation of autoantigen expression and apoptosis. **Methods:** Immortalized human salivary acinar cell line NS-SV-AC cells were incubated with EGCG (epigallocatechin-3 gallate), the most abundant GTP, prior to determination of expression changes in major autoantigens by microarray, RT-PCR and Western analysis. To investigate effects on apoptosis, cell viability changes were measured by MTT assay after the cells were exposed to tumor necrosis factor (TNF)-alpha with or without EGCG treatment. To determine whether GTPs could protect against or ameliorate SS NOD and MRL mice representing two mouse models of the disease were either fed with GTP-water or water only prior to analysis of lymphocytic infiltration in the submandibular glands. **Results:** EGCG inhibited the expression of major autoantigens and protected NS-SV-AC cells from TNF-alpha-induced cytotoxicity, possibly mediated by a p38 MAPK pathway. NOD and MRL mice fed with GTPs exhibited significantly reduced lymphocyte infiltration in the salivary glands. **Conclusions:** in vitro, GTPs provide a measure of protection against two SS disease mechanisms: autoantigen expression and apoptosis. This may explain, in part, GTP-mediated protection of salivary glands in two animal models. These findings, taken together with green tea's anti-inflammatory and anti-apoptotic properties, suggest that GTPs could serve as an important component in novel approaches to delay and reduce the severity of SS. This study was supported in part by NIH grant 5R21CA097258-02.

0624 EFFECT OF ORAL MUCOSA CLEANING ON SALIVARY BACTERIA LEVELS

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Epithelial cells desquamated from the oral mucosa can become a part of the plaque biofilm matrix as well as serve as a key source of nutri-

ents for bacteria. The cleansing of these cells may help to improve the oral conditions of patients. **Objective:** This study evaluates the effect of cleansing oral mucosal surfaces with a specialized toothbrush with and without a soft-tissue cleaning implement on the back of the toothbrush head on the level of salivary bacteria. **Methods:** In this randomized, cross-over study, healthy adult subjects brushed their teeth for 1 min with the assigned toothbrush. Salivary samples, collected at baseline and up to 2 hours after use, were analyzed for epithelial cells using a colorimetric assay and for bacteria grown on generalized blood media. DNA was extracted from the bacteria in the collected salivary samples and analyzed by real-time PCR. Representative bacteria that are implicated in various oral conditions were chosen as markers: Prevotella melaninogenica, Prevotella intermedia, Porphyromonas gingivalis, Fusobacterium nucleatum, and Streptococcus mutans. **Results:** The specialized toothbrush with the cleaning implement statistically significantly ($p<0.05$) reduced the levels of both the salivary levels of desquamated cells and total bacteria including the DNA of bacteria implicated in the formation of halitosis, gingivitis and caries compared to the toothbrush without the cleaning implement. **Conclusion:** The clinical results indicate that the cleaning implement on the back of the head of a specialized toothbrush is effective in reducing the levels of desquamated epithelial cells, a key nutrient source for oral bacteria, as wells total salivary bacteria including the DNA of problematic bacteria.

MOUTHRINSES

1542 REDUCING ORAL MUTANS STREPTOCOCCI LEVELS WITH XYLITOL MOUTH RINSE

G. HILDEBRANDT, I. LEE, and J. HODGES, University of Minnesota -, Minneapolis, USA

Xylitol-sweetened chewing gum has cariostatic properties, but is not suitable for all caries-prone patients. **Objectives:** The purpose of this study was to compare the effect of xylitol rinse and xylitol chewing gum on mutans streptococci (MS) load on the dentition. **Methods:** 202 subjects were screened for MS levels in paraffin-stimulated saliva. 104 qualifying subjects (i.e., ≥5 log CFU/ml) were randomly assigned to one of three groups. Positive control subjects (N = 34) chewed two xylitol gum pellets [Spry™, Xlear Inc., Orem, UT] for at least 5 minutes three times daily (xylitol dose: 4.3g/day). Experimental group subjects (N = 36) rinsed with 20ml of an 11%-aqueous solution of xylitol twice daily for 60 seconds (dose: 4.3g/day). Negative control group subjects (N = 34) did not use either product. No attempt was made to change the subject's diet. Salivary MS levels were monitored at one and three months. Compliance was very high as measured by use-diaries and exit questionnaires. **Results:** Mean MS levels [log CFU/ml (SE)] at baseline were 5.6 (0.1) in positive control, 5.5 (0.1) in experimental, and 5.5 (0.1) in negative control subjects. After 3-mos, MS levels were 4.4 (0.2) in the positive control, 4.4 (0.2) in the experimental, and 4.9 (0.2) in the negative control groups. Differences between groups were not significant by ANOVA ($p = 0.2$), however, MS levels tended to be lower in the experimental and positive control groups. **Conclusion:** Both xylitol rinse and chewing gum caused a similar reduction in MS levels on the dentition. This effect might be increased by altering exposure time, concentration, etc. Larger studies will be needed to determine if xylitol rinse can reduce caries incidence in high risk populations. Supported by the Minnesota Oral Health Clinical Research Center.

2053 COMPARATIVE EFFICACY OF TWO MOUTHRINSES IN A 6-MONTH STUDY

J.J. WITT[1], R. GIBB[1], A. HAMILTON[1], N. LANG[2], A. ALBERT-KISZELY[2], B.E. PJETURSSON[2], G.E. SALVI[2], and G.R. PERSSON[2], [1]The Procter & Gamble Company, Mason, OH, USA, [2]University of Berne, Switzerland

Objective: The objective of this study was to compare the effects of a commercial CPC (cetylpyridinium chloride) mouthrinse containing 0.07% CPC (Crest® ProHealth Rinse) versus those provided by a commercial essential flavor oil mouthrinse (Listerine® Antiseptic) on dental plaque accumulation and prevention of gingivitis in an unsupervised 6 month clinical study. **Methods:** This was a double blind, 6-month, parallel group, positive controlled study involving 128 subjects who were balanced and randomly assigned to either positive control (essential oil) or experimental (CPC) mouthrinse treatment groups. The CPC mouthrinse passed proposed performance assays by the FDA for an OTC CPC mouthrinse. At baseline, subjects received a dental prophylaxis and began unsupervised rinsing twice daily with 20 ml. of their assigned mouthrinse for 30 seconds after brushing their teeth for 1 min. Subjects were assessed for gingivitis and gingival bleeding by the Gingival Index (GI) of Loe and Silness and plaque by the Silness and Loe Plaque Index (PI) at baseline and after 3 and 6 months of product use. Oral soft tissue health was also assessed. Microbiological samples were also taken for community profiling by the DNA-DNA checkerboard method. **Results:** Results show that after 3 and 6 months use there was no significant difference ($p = 0.05$) between the CPC and essential oil mouthrinse treatment groups for overall gingivitis status, gingival bleeding, and plaque. At 6 months the covariant (baseline) –adjusted mean GI and bleeding sites numbers for the CPC and essential oil mouthrinses were 0.52 and 0.53 and 5.5 and 6.3, respectively. Both mouth rinses were well tolerated by the subjects. Microbiological community profiles were similar for the 2 treatment group. **Conclusion:** This study shows that the 0.07% CPC mouthrinse can provide similar plaque and gingivitis benefits to those provided by an essential oil mouthrinse over a 6 month period.

TOOTHPASTES

0695 DENTAL PLAQUE CONTROL EFFECT OF A ZINC CITRATE DENTIFRICE

V.M. BARNES, R. RICHTER, D. BASTIN, P. LAMBERT, and T. XU, Colgate-Palmolive Technology Center, Piscataway, NJ, USA

Effective anti-plaque dentifrices have been a long standing demand of consumers. In addition to the obvious oral benefits of dental plaque control such as caries reduction and gingivitis prevention, the link between a healthy mouth and a healthy body has further driven the demand for efficacious oral care products. Zinc ion is a well-known bacteriostatic agent and has been used in dentifrices for control of dental plaque. **Objective:** This research evaluated the anti-plaque efficacy of a new 2% zinc citrate fluoride dentifrice vs. a non-zinc matching placebo and a commercial fluoride dentifrice (Colgate Dental Cream – CDC) in two cross-over clinical studies. **Method:** Healthy human subjects meeting inclusion criteria entered two respective clinical studies. Study 1 (24 subjects) compared the zinc dentifrice to CDC (over a 24 hours period. Study 2 (19 subjects) compared the zinc dentifrice to the matching placebo over a 24 hour period. After 1 week of washout, subjects used the test product for 1 week prior to the test period. Both studies employed the Modified Gingival Margin Plaque Index (MGMPI), a clinical method measuring dental plaque formation along the gingival margin after 24-hrs post-brushing. **Result:** In study 1, the mean MGMPI score, representing post-treatment plaque regrowth along the gingival margin for the zinc prototype as compared to CDC was 13.87±8.27 and 21.23±11.08 respectively. Study 2 demonstrated mean MGMPI scores for the zinc dentifrice and a matching placebo were 14.99(±13.32) and 24.38(±7.69) respectively. In both studies, the zinc dentifrice demonstrated significant 35% and 39% inhibition of dental plaque formation than those of their respective controls, CDC or a matching placebo. **Conclusion:** Two clinical studies demonstrated plaque control efficacy for a new zinc citrate containing dentifrice, suggesting a new anti-plaque and possible multi-benefit dentifrice for effective oral hygiene.

0634 CLINICAL ANTIMICROBIAL EFFICACY OF THE TRICLOSAN/COPOLYMER DENTIFRICE ON ORAL MICROORGANISMS

D. FINE[1], D. FURGANG[1], K. MARKOWITZ[1], P. SREENIVASAN[2], and W. DE VIZIO[2], [1]New Jersey Dental School - UMD, Newark, USA, [2]Colgate - Palmolive Company - / Piscataway, NJ, USA

Objectives: This cross-over design clinical study compared the in vivo antimicrobial effects following regular use of the triclosan/copolymer dentifrice and a fluoride toothpaste on oral microorganisms of dental plaque, saliva and tongue. **Methods:** Fifteen adults (27-49 years) com-

pleted a 1-week washout with a commercial fluoride dentifrice (CFD) prior to baseline sampling of supragingival plaque, saliva and tongue. Agar plating quantified total anaerobes, hydrogen sulfide (H_2S) producing bacteria, Veillonella and Fusobacteria. Subjects were randomly assigned CFD or the triclosan/copolymer dentifrice for twice daily use for the next week. On day 8 subjects brushed with assigned dentifrice and provided samples (plaque, saliva and tongue scrapings) at 6 and 12 hours post brushing for enumeration of study bacteria This concluded one phase of the cross-over with subjects undergoing a 1-week washout prior to assignment of the second dentifrice. **Results:** All baseline samples demonstrated no differences in bacterial populations prior to random assignments of test dentifrices ($p>0.05$). A significant reduction (88-96%) of total anaerobic bacteria of the tongue, saliva and supragingival plaque samples were observed in the triclosan/copolymer group at both the 6 and 12 hour in comparison to subjects provided CFD ($p = 0.001$). Subjects brushing with triclosan/copolymer demonstrated a 77-92% decrease in Fusobacteria and a 84-89% reduction of Veillonella at 6 and 12 hour post-brushing versus CFD. A significant (74-85%) decrease in H_2S producing bacteria were observed in the triclosan/copolymer group at 6 and 12 hour post-brushing ($p = 0.001$). **Conclusions:** Brushing with triclosan/copolymer resulted in significant and sustained reductions (for 12 hours post-brushing) in several microorganisms of the dental plaque, saliva and tongue compared to a commercial fluoride dentifrice. Antimicrobial effects of triclosan/copolymer may help explain the significant reductions in supragingival plaque and associated gingivitis observed with this dentifrice in previous clinical trials. Funded by the Colgate-Palmolive Co.

WHITENING

0882 WHITENING AGENTS WITH ACP: ENAMEL CARIES FORMATION AND PROGRESSION

C. FLAITZ, University of Texas Dental Branch - Houston, USA, and J. HICKS, Baylor College of Medicine, Houston, TX, USA

Objective: This *in vitro* study evaluated the effect of whitening agents containing amorphous calcium phosphate (ACP) on human enamel caries formation and progression. **Methods:** 15 teeth with sound enamel surfaces were divided into 4 portions. Each tooth portion was assigned to a treatment group: 1) No Treatment Control; 2) Day White Excel 3 - 9.5% hydrogen peroxide ACP; 3) Nite White Turbo - 6% hydrogen peroxide ACP; 4) Nite White - 16% carbamide peroxide ACP. The teeth were treated according to the manufacturer's recommendations (Discus Dental Inc, Culver City, CA 90232), followed by synthetic saliva, on a daily basis for 14 days. Control tooth portions were exposed only to synthetic saliva. A modified ten Cate solution was used for *in vitro* enamel caries formation and progression. The teeth were treated prior to lesion formation, and before lesion progression 1 and lesion progression 2 periods. Longitudinal sections were taken after lesion formation, lesion progression 1 and lesion progression 2 periods for polarized light study and statistical analysis (ANOVA, DMR). **Results:** Mean lesion depths were: **Lesion Formation Period**: Control 108±15um; Day White 93±11um; Nite White Turbo 48±7um ($P<.05$); Nite White-16% 105±12um. **Progression Period 1**: Control 171±18um; Day White 126±13um ($P<.05$); Nite White Turbo 96±9um ($P<.05$); Nite White-16% 132±12um ($P<.05$). **Progression Period 2**: Control 228±20um; Day White 165±17um ($P<.05$); Nite White Turbo 129±11um ($P<.05$); Nite White-16% 152±16um ($P<.05$). **Conclusions:** Whitening agents containing calcium phosphate have a reduced susceptibility to *in vitro* enamel caries lesion initiation and progression.

0687 SAFETY OF OVERNIGHT WHITENING WITH A BRUSH-APPLIED PEROXIDE GEL

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Objectives: Clinical research was conducted to evaluate safety of a brush-applied peroxide-based whitening gel across a diverse population. **Methods:** After informed consent, 560 healthy adult subjects were screened to ascertain whitening history and current tooth sensitivity. Of these, 544 were assigned to treatment with a 19% sodium percarbonate brush-applied whitening gel (Crest® Night Effects™) that dries to form a film. Treatment was unsupervised QD for 14 nights. Safety and tolerability were assessed from clinical examination (baseline and end-of-treatment) and interview. Adverse events were collected irrespective of causality. **Results:** 511 subjects completed the 14 night regimen. The study population exhibited considerable diversity. Mean (SD) age was 41.3 (13.4), ranging from 18-98. Most (74%) participants were female, and 12% of the sample reported daily tobacco usage. A total of 63 subjects (12%) had a possibly or probably-related adverse events during treatment. These were predominantly symptomatic events, particularly oral irritation (6.1% of subjects) and tooth sensitivity (5.5%). 95% confidence intervals for percent occurrence were (4.16%, 8.50%) for oral irritation and (3.67%, 7.82%) for tooth sensitivity. Only two subjects (0.4%) had both oral irritation and tooth sensitivity during treatment. Clinical examination findings were unremarkable. Adverse events were overwhelmingly (99%) mild in severity, though 1 subject reported moderate pharyngitis during the treatment. No subjects discontinued use early due to treatment-related adverse events. **Conclusion:** Use of a 19% sodium percarbonate brush-applied film over 14-days was well tolerated, with mild and transient oral irritation or tooth sensitivity representing the most common adverse events associated with treatment.

RESEARCH METHODOLOGY

1478 INTRA-EXAMINER RELIABILITY IN A CLINICAL TRIAL AMONG OLDER VETERANS

C. WEHLER[1], S. RICH[1], R. GARCIA[2], E. KRALL[2], and J. JONES[1], [1]Boston University School of Dental Medicine, VA Medical Center (Bedford, MA), MA, USA, [2]Boston University School of Dental Medicine, VA Medical Center (Boston, MA), MA, USA

Objective: Clinical trials must carefully monitor intermediate outcome measures. We examined the intra-examiner reliability from a randomized, controlled, clinical trial of periodontal disease and diabetes among users of VA health care. **Methods:** This study randomized 193 subjects. Due to exclusions and attrition over time, 165 were seen for clinical exams (mean age 59.1, 97% male). A dental hygienist examined each subject seen in this study three times over the course of one year. Every tenth subject underwent the regular exam, followed by a calibration exam, for a total of 47 calibration exams. The calibration exams consisted of measuring gingival recession (6 sites per tooth, in mm), Gingival Index (3 sites on 6 index teeth, range 0-3), mobility (greater than 1mm in any direction, yes/no), and tooth identification. Also, full mouth periodontal probing (6 sites per tooth, in mm) was completed on each subject twice at each study visit to assure maximum reliability of these data; thus, calibration results for probing depths are available on 386 individual exams. Percent agreement, kappa statistics, and correlation were calculated on both a per person basis and per surface/tooth basis. **Results:**

		Per surface/tooth analysis			*Per person analysis*		
Variable	*n*	*% Agree*	*Kappa*	*Correlation*	*% Agree*	*Kappa*	*Correlation*
Pocket depth	386	72.0	.709	.845	86.5	.799	.942
Recession	47	92.4	.879	.893	72.3	.905	.988
Mobility	32	96.0	.805	.819	75.0	.691	.970
Gingival index	47	85.4	.736	.852	76.6	.899	.979
Tooth identification	32	99.8	.996	.998	93.8	.932	.999

Conclusions: These results suggest that a dental hygienist can attain a high level of intra-examiner reliability in a large-scale study among a population of older veterans. Supported by VA HSR&D QUERI DII 99.206, NIH K24 DE00419, Boston University, and the Department of Veterans Affairs.

Établir des relations *(suite de la page 283)*

Stephen Covey, dans son livre *7 Habits of Highly Effective People*, définit la sixième habitude « Synergie » ou l'habitude de coopération créative – comme étant le principe que le tout est plus grand que la somme de ses parties. Ce principe impose implicitement de voir le bon et le potentiel dans la contribution de l'autre personne. La synergie en pratique de l'hygiène dentaire signifie que les membres de l'équipe dentaire travaillent ensemble pour offrir les meilleurs soins possibles axés sur le client. La synergie à l'ACHD est représentée par les desseins et les commentaires de ses membres, appuyés par le conseil d'administration, la directrice exécutive et le personnel. Le conseil d'administration formule et concentre ses fins et ses objectifs tels qu'énoncés par les membres. Ce sont ces relations qui ont rendu possible la croissance de cette organisation. L'ACHD est un bon exemple des résultats qui peuvent être obtenus quand toutes les parties apprécient les forces et les désirs des autres et travaillent ensemble pour aller de l'avant.

La synergie en pratique de l'hygiène dentaire signifie que les membres de l'équipe dentaire travaillent ensemble pour offrir les meilleurs soins possibles axés sur le client.

Lorsque vous assistez aux conférences nationales de l'ACHD, vous avez la possibilité de mettre la synergie en pratique en établissant un réseau avec d'autres hygiénistes dentaires et en discutant des défis communs de notre profession. Il y a différentes activités qui favorisent la discussion et la rétroaction. Actuellement, l'ACHD utilise les commentaires que vous avez fait lors de la rencontre de discussion ouverte à Ottawa en 2005 ainsi que les commentaires des membres à Edmonton en 2006 pour modifier l'organisation et répondre à vos besoins. Je vous encourage à continuer de profiter de ces occasions pour développer votre propre relation personnelle avec l'ACHD et faire que votre voix soit entendue. Au cours de la prochaine année, j'attends avec impatience d'avoir de vos nouvelles et de vous rencontrer personnellement puisque nous serons les hôtes de la conférence de la IFDH (International Federation of Dental Hygienists) à Toronto en juillet 2007. Ce sera là une autre occasion d'établir des relations avec des hygiénistes dentaires venant du Canada et de partout dans le monde.

On peut communiquer avec la présidente à l'adresse <president@cdha.ca>.

Board changeover at October 2006 meeting - Patty Wickstrom is leaving after having represented Alberta for many years both as a board member and president of CDHA. Also leaving is Susan Vogt who has served on the board from early 2004, representing Saskatchewan. Their commitment to CDHA and the dental hygiene community is noted with great appreciation. Bonnie Blank was welcomed as the incoming president with Diane Thériault becoming past president and Carol-Ann Yakiwchuk the new president elect. Evie Jesin was elected for a second term as Ontario representative, Palmer Nelson for a second term as the Newfoundland and Labrador representative. New additions to the board are Maureen Bowerman representing Saskatchewan and Lucia Scharfenberger representing Alberta.

Patty Wickstrom
Alberta

Sue Vogt
Saskatchewan

Bonnie Blank
President

Diane Thériault
Past President

Carol Yakiwchuk
President Elect

Les récompenses des défis *(suite de la page 287)*

L'un de nos membres a pris le temps de nous écrire une lettre très convaincante concernant l'article sur l'utilisation de la soie dentaire. Il a noté l'importance de poser les bonnes questions pour obtenir des réponses non biaisées. Il a également introduit la notion de sens commun et le besoin de recherche qui ne soit pas si pur qu'il néglige d'autres choses qui, d'un point de quotidien, n'ajoute rien à l'ensemble. En réponse aux préoccupations du membre, l'auteure de l'article sur la recherche qui appuie la déclaration de l'ACHD a noté que « la recherche est seulement une des composantes de la prise de décision fondée sur des éléments probants ». Pour pondérer ce point, elle souligne également le phénomène humain de résistance au changement auquel plusieurs d'entre nous sont confrontés lorsqu'il s'agit de convictions auxquelles nous sommes attachés depuis longtemps. J'avais espéré pouvoir publier la lettre du membre ainsi que la réponse de l'auteur pour poursuivre le dialogue. Malheureusement, le membre ne se sentait pas à l'aise avec une telle présence publique.

L'inconfort du membre m'a mené vers un courant de pensées plus profondes. C'est une réaction normale de ne pas aimer un conflit perçu et d'essayer de l'éviter. Plutôt que d'utiliser une approche généralisée qui suggère que tout conflit est négatif, j'aimerais proposer que nous pensions que certains conflits puissent être une expression très positive de la pensée critique. Je suis d'accord que, parfois, un conflit consomme notre énergie pendant que nous essayons d'en sortir. Cependant, d'autres fois, nous pouvons ressentir une poussée d'énergie très positive si nous recadrons le conflit comme une expérience d'apprentissage. Quelques fois, remettre en question des convictions que nous avons depuis longtemps crée une opportunité de croissance.

Je me rappelle l'histoire de quatre générations de femmes qui cuisinaient un jambon pour l'Action de grâce. La jeune sœur demanda à sa mère pourquoi elle coupait l'extrémité du jambon avant de le mettre dans la rôtissoire. La mère répondit qu'elle ne le savait pas ; elle l'avait appris de sa mère qui l'avait toujours fait de cette manière et elle appela sa mère. Sa mère lui répondit la même chose – elle l'avait appris de sa mère – et elle appela sa mère à son tour. L'arrière-grand-mère de la petite qui avait commencé le questionnement critique répondit à sa fille qu'elle faisait cela parce que c'était la seule façon de faire entrer le jambon dans sa rôtissoire. Il y a peu de sources que nous considérons comme plus crédibles que nos mères, bien que dans cet exemple amusant, nous puissions voir à quel point la pensée traditionnelle est au centre de nos systèmes de convictions.

La pensée critique peut parfois nous mettre dans une situation inconfortable. Un conflit peut parfois émerger lorsque de nouvelles idées s'opposent à ce que nous considérons comme le sens commun. Poser des questions est une bonne chose, mais être ouvert aux réponses est aussi une bonne chose. Comme le dit le proverbe chinois, « Les pierres précieuses ne peuvent être polies sans friction, pas plus que l'homme ne peut se perfectionner sans essais ». Alors que nous développons l'ensemble des connaissances qui définissent l'hygiène dentaire, je vous invite tous et toutes à jouer un rôle actif et à questionner et à commenter, comme plusieurs de nos membres le font, ce que vous lisez dans ces pages, sur notre site Web et lors de consultations spécifiques. Je vous invite également à être ouverts et ouvertes aux réponses que vous recevez. Vous n'avez pas à les aimer mais accordez-leur une certaine pensée critique.

Pour terminer, je veux remercier personnellement tous ceux et toutes celles qui prennent le temps de nous faire part de leurs commentaires sur ce que nous faisons bien et ce que nous ne faisons pas bien. J'apprécie que vous preniez le temps d'aider votre association à croître et, par le fait même, aider la profession à progresser. Je désire également remercier Mme MacDonald d'avoir soulevé un point que plusieurs d'entre nous tiennent comme admis et de nous aider à le voir avec des yeux critiques.

Mes meilleurs vœux pour de joyeuses Fêtes et une nouvelle année excitante.

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Journals in Our Library

by CDHA staff

WE ALL VALUE THOSE SPECIAL REFERENCE TEXTS ON our bookshelves but the fact is that dental hygiene practitioners must rely on professional journals for the most recent scientific information. Scientific journals provide us with reliable data because of the process of peer review. Peer review involves experienced and knowledgeable professionals in the relevant discipline who evaluate a research paper before it is published. Peer reviewers consider, and provide feedback on, the validity, significance, and timeliness of the information in an article. Journal editors then use these comments to assist the author in revising the article for greater clarity.

In this column, we will introduce some of the journal holdings in the CDHA library and an excellent electronic journal with free subscription (*Grand Rounds in Oral-Systemic Medicine*).

RDH: The National Magazine for Dental Hygiene Professionals

www.rdhmag.com

Published monthly by PennWell, *RDH* contains articles of interest to the "chair side" dental hygienist. Additional features include continuing education courses, RDH marketplace and product information section. RDH full-text articles are also available free on-line.

Grand Rounds in Oral-Systemic Medicine

www.thesystemiclink.com

PennWell also publishes *Grand Rounds in Oral-Systemic Medicine (GR)*, a quarterly, refereed journal. The May 2006 issue of GR focuses on the bi-directional relationship and management of diabetes and periodontal disease. Free subscriptions are available at **www.subscribe-thesystemiclink.com** or full-text articles can be viewed on line at **www.thesystemiclink.com**.

Oral Health: Canada's Leading Dental Journal

Oral Health magazine is "dedicated to providing monthly clinical information to …both general practice and major specialties." Recent clinical advances in all phases of dentistry as well as the latest in dental materials and technology are part of each issue. *Oral Health* offers its readers self-learning and self-assessment opportunities in every issue.

Journal of Periodontology

This journal is the official publication of the American Academy of Periodontology. It is published monthly and features scientific articles "relevant to the science and practice of the treatment of periodontal diseases." The August 2006 issue contains an article reporting on a randomized controlled trial (RCT) comparing interdental cleaning methods, and a report on clinical efficacy of flossing versus use of antimicrobial rinses—important information for evidence-based dental hygiene practice. This same issue features an AAP-commissioned review of diabetes mellitus and periodontal disease that provides "a broad overview of the predominant research findings of the past 20 years."

Access: An Official Publication of the American Dental Hygienists Association

Access is an informative magazine that focuses on health and practice news, professional issues, and legislative developments. It provides current news on issues that are important to dental hygienists—multiple practice settings, infection control, genetic engineering, women's health, product news, new technology, and periodontal trends. *Access* also brings the reader regular departments in quick-read formats designed for busy schedules. Of particular interest in the July 2006 issue is the ADHA's draft document outlining the Advanced Dental Hygiene Practitioner curriculum.

International Journal of Dental Hygiene

This is the official journal of the International Federation of Dental Hygienists, a scientific, peer-reviewed journal published quarterly. The aim of the journal is to provide the "latest scientific news, high quality commissioned reviews and clinical, professional and educational developments and legislative news to the profession worldwide." It also "acts as a forum for exchange of relevant information and enhancement of the profession." To review journal abstracts and register for table of contents e-mail alerts, visit **www.blackwell-synergy.com**.

Journal of Public Health Dentistry

This journal, produced quarterly, is an official publication of the American Association of Public Health Dentistry and is "devoted to the advancement of public health dentistry through exploration of related research, practice and policy developments." Three main types of articles are published: original research, articles on methods that report the testing of new approaches to research, and review articles that synthesize previous research. Submissions for C*ommunity Action Reports*, which analyze initiatives in the dental public health community, are also encouraged. The summer 2006 issue featured an article on working practices and job satisfaction of dental hygienists in New Zealand.

We will continue the review of our journal holdings in the next issue. Unfortunately, journals in the CDHA library are not available for loan. However, you can request articles to be sent to you. Articles that are copyright cleared are **free** for the first 20 pages; after that, the cost is $0.20/page plus GST for CDHA members. Fax charges are $5 (outside Ottawa) for the first 10 pages; the charge for additional pages is $1/page plus GST.

Critical Thinking on the Net

by CDHA Staff

CRITICAL THINKING, A NECESSARY SKILL OF THE COMpetent dental hygienist, is a learned skill. The following sites will help clarify the concept, develop techniques to use, questions to ask, and provide links to tutorials, conferences, publications, and other websites.

The Critical Thinking Community
www.criticalthinking.org
This organization, composed of the Center for Critical Thinking and Moral Critique and the Foundation for Critical Thinking, promotes critical thinking through its professional development courses, its annual conference, its publications, and its extensive links to article on various aspects of critical thinking. They define critical thinking clearly and relatively succinctly: "Critical thinking is that mode of thinking—about any subject, content, or problem—in which the thinker improves the quality of his or her thinking by skillfully analyzing, assessing, and reconstructing it. Critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking."

While the courses and publications are fee-based, the full-text articles are available free on-line and grouped into the following categories: Fundamentals of Critical Thinking; Documenting the Problem; Professional Development; Research in Critical Thinking; The Questioning Mind; Ethical Reasoning; Critical Thinking and Assessment; Cognition and Affect; Global Change; Sample Teaching Strategies for University and College Faculty. An interesting site that explores the extent of critical thinking.

AusThink – Critical Thinking on the Web
www.austhink.org/critical/
Austhink is a critical thinking research, training and consulting group specializing in complex reasoning and argumentation. One of this site's pages is *Critical Thinking on the Web* that is an extensive listing of quality on-line resources. Topics range from Bibliographies; Blogs; Critical Reading and Writing; Great Critical Thinkers; Group Thinking; Hoaxes, Scams, and Urban Legends; Language and Thought; Logic; Theory and Research; to Tutorials. One excellent section on the page is the "Top Ten" links that provide a huge amount of information. These ten items are internal and external links and include the following: Argument Mapping Tutorials; The Skeptic's Dictionary; The Fallacy Files; Critical Thinking: What It Is and Why It Counts; Chance [probability and statistics]; Psychology of Intelligence Analysis; A Handbook on Writing Argumentative and Interpretative Essays; and Baloney Detection! Well worth a visit.

Mission: Critical (Interactive tutorial)
www2.sjsu.edu/depts/itl/
As it states on this website, "the goal of **Mission: Critical** is to create a 'virtual lab,' capable of familiarizing users with the basic concepts of critical thinking in a self-paced, interactive environment." The site is created by the Institute for Teaching and Learning at San Jose State University. There are three versions of the tutorial with the oldest and original version (1996-1998) free to users. The other two versions are credit courses for which one needs to register and pay. The tutorial introduces the user to basic concepts, using "sets of instructions and exercises." This is a valuable introduction, with immediate feedback, to the world of critical thinking. There are also links to other critical thinking website and to an annotated list of texts on the subject.

Critical Thinking and the Internet (Wilfred Laurier University)
http://library.wlu.ca/critical/
This site promotes critical thinking about Internet sites — essentially analyzing the reliability and authority of sites. This topic was explored in the March-April 2006 issue of this journal, in the *Library Column* (Vol. 40, No. 3, p. 99). But the site also has an excellent "Recommended Reading" section that investigates Internet use and assessment of sites by different groups of people in a range of disciplines. It also has many entries that deal with the need for skepticism for material on the Internet.

SUBJECT INDEX

AUTHOR INDEX

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CALGARY Eastport Dental is looking for one full-time or two part-time dental hygienists to take over for maternity leave starting February 2007 tentatively to October 2007. After that point, a part-time position would likely be available to the candidate if desired. We are looking for somebody with excellent interpersonal skills and a good command of English. Please fax résumé to **403-248-5331** or e-mail it to **calgarydentalteam@hotmail.com**.

MANITOBA

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Advertisers' Index

Periodontal-Systemic Disease Connection

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