Dalhousie University, Faculty of Dentistry

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Stimulus & Challenge

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A Prayer for Research and Higher Education.

Nova Scotia Higher Education Commission and university presidents are struggling with university rationalization. We face proposed cuts of millions of dollars in provincial and federal funding. We all know that times are tough, as academics we are struggling with increasing competition to obtain research funding with a declining pool of federal money committed to supporting university based research. The more time we spend chasing research dollars, the less time we have to write our scholarly papers. Reductions in numbers of our academic colleagues results in an increasing teaching and clinical load for remaining faculty members. Times are tough for young faculty members who are aiming to establish themselves. Some individuals have commented that university administrators in order to balance budgets and succeed in the current world, need in these difficult times to have the capability of walking on water. However, if we believe one report at least even God was never granted tenure at any university. Dr. Barry Pass provided the confidential tenure report documentation which he retrieved from an E-mail message from a radiology conference report.

The report gives 16 reasons WHY GOD NEVER RECEIVED TENURE AT ANY UNIVERSITY

1) He had only one major publication.
2) It was in Hebrew.
3) It had no references.
4) It wasn't published in a refereed journal.
5) Some even doubt he wrote it himself.
6) It may be true that he created the world, but what has he done since then?
7) His cooperative efforts have been quite limited.
8) The scientific community has had a hard time replicating his results.
9) He never applied to the Ethics Board for permission to use human subjects.
10) When one experiment went awry he tried to cover it by drowning the subjects.
11) When subjects didn't behave as predicted, he deleted them from the sample.
12) He rarely came to class, just told students to read the book.
13) Some say he had his son teach the class.
14) He expelled his first two students for learning.
15) Although there were only ten requirements, most students failed his tests.
16) His office hours were infrequent and usually held on a mountaintop.

So if you are feeling down in the dumps because you failed to get a grant, or that you failed to get tenure or promotion. Give a thought to others who are also in the same position. You may wish to consult a higher authority and say a prayer, he (or is it she) may understand.

Seal of Approval from WHO

The Dental Research News is pleased to report, that Dr. Amid Ismail, Head, Dept. of Community and Pediatric Dentistry received notice on the 14th November 1994, that he had been awarded $5,000 (US) from the World Health Organization. This funding is to support his project entitled "Effectiveness of sealing early carious pits and fissures of first permanent molars in Alexandria, Cairo and Giza." This very prestigious award recognizes the expertise and quality of the research conducted by Dr. Ismail over the past several years. The international recognition which this award brings will help to facilitate the acquisition of other research funding for our Dalhousie Dental Faculty.

GREETINGS OF THE SEASON AND BEST WISHES FOR A HAPPY NEW YEAR TO ALL READERS.

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Reinventing Dalhousie

While some were simply talking about Reinventing Dalhousie on Friday the 18th November, in the Division of Biomaterials, members were frantically Reinventing Dalhousie's participation in a Centres of Excellence initiative. As reported in the October Research News, conformation had been received that the preliminary *Letter of Intent* for a National Networks and Centres of Excellence programme in Biomaterials had been successful. The hectic task of producing the full proposal for the deadline of January 1995 is now underway. The Dalhousie group are part of a very powerful national group with participation from the Maritimes to BC, with some 18 research projects. The three preliminary projects which were put forward in September as part of Dalhousie's participation were highlighted in the September issue of the DRN. Following a planning meeting in Toronto on November 10th, it was agreed that there was a needed to produce a much more focused research programme with clear linkages between projects. This policy meant going back to the drawing board and changing two of the three projects proposed by our Dalhousie group. Our projects have now been reinvented and summaries of these three projects are reported in this issue of the Dental Research News. These projects have participation from four faculties at Dalhousie. This shows collaboration and team work at its best. The projects also clearly acknowledge the research role of the Division of Biomaterials which has a much broader base in biomaterials than dentistry, this further reflects and underlines the fact that the Division is part of both Faculties of Medicine and Dentistry. The National Biomaterials group application is now one of only three groups which are being considered for funding as part of the Advanced Materials Sector of the federal C of E programme. Thus we stand a one in three chance of being successful. Sixty four other groups have been eliminated in the first phase of the selection process. Our projects if approved will provide significant opportunities for further collaborative ventures with additional colleagues in the Faculties of Medicine, Dentistry and Health Professions, as well as our colleagues in Science.

Three C of E Project Proposals

The first of these C of E projects is titled: *"Biomaterial Matrices for Bioeffectors."* This will be conducted by Derek Jones and Amin Rizkalla in collaboration with Harold Robertson of the Dept. of Pharmacollogy. The goal is to optimize methods for synthesizing and developing biomedical glass-like and gel materials. The basic principle is to form a solution of the glass constituents in an organic solvent, which undergos polymerization producing a gel. There are interesting possiblities which present themselves for producing hydrated particulates which can act as stable carriers of organic bioactive molecules, capable of acting as slow release systems. The main objective will be to develop and study methods to make use of Sol-Gel encapsulation of biomolecular materials. The organic molecular species will be either entrapped within the permeable glass-like particulate or attached via direct chemical bonding to the outer surface. Oligodeoxynucleotides will be encapsulated and implanted in small animals. Once the delivery techniques are perfected, we will expand the studies to animal models for stroke, in which a number of genes play a role. Once perfected the delivery system can be considered in addition to its use for stroke, as a possible therapeutic system for problems such as, Alzheimer's disease, cancer and AIDS. A central problem in antisense oligodeoxynucleotidegode therapy is drug delivery. For central nervous system disorders such as Alzheimer's disease the drug type approach is limited by the blood-brain barrier which effectively excludes large oligodeoxynucleotides from the brain. Many have molecular weights of 7,000-10,000. Techniques to deliver large bioeffector molecules is a primary consideration. Thus, sol-gel encapsulation of biomolecular materials is particularly attractive.

The second of the projects is titled: *"Development of Biomimetic Bioactive Glass-Ceramic Biomaterials."* This project will be conducted by Amin. Rizkalla and Derek Jones in collaboration with Brian Hall, (Biology) and Barry Clarke (Earth Science). The aim of this project will be to develop glass-ceramic formulations with optimal bioactivity and improved mechanical properties and test these formulations by means of chemical and biological assays. These goals will be supported through a study of the mechanism of glass synthesis and osteogenic activity. We will seek to demonstrate the selective adsorption of specific proteins by reactive surface layers. Rat marrow cells will be used to study the relative adsorption of osteopontin and bone sialoprotein on different bioactive surfaces. Our assumption is that protein adsorption will distinguish between the glasses of differing (chemical composition) reactivity. The biological activity of these materials will be further evaluated by *in vitro* studies using the mechanism of initiation of osteogenesis and chondrogenesis in embryonic mesenchyme. We aim to use bioactivity to help design more complex bioactive glass-ceramic systems with the

(*Bioactive Glass-Ceramics*, cont.) objective of producing materials with superior bioactive activity combined with improved mechanical properties which may extend the application of this class of biomaterials. Materials of controlled surface activity (or biodegradability) showing direct bonding to bone have been termed "bioactive." Such glass-ceramic compositions may allow release of ions conducive to osteo-genesis. Bioactive glasses capable of forming chemical bonds to natural tissues may offer potential for long-term stabilization of implants. Strength of bioactive ceramic coatings is important due to their intermediate function of stress transfer from the implant prosthesis to surrounding tissues. Degenerating bone disorders such as those associated with periodontal disease, osteo- and rheumatoid arthritis, bone cancer, avascular necrosis as well as trauma, together with greater use of implants, have increased the need for bone substitutes or as a stimulant for osteogenesis. We have an aging population combined with a larger proportion surviving into old age, thus, application of synthetic biomaterials as substitutes for natural tissues becomes increasingly important. Synthetic materials are being used more frequently and aggressively in biomedical applications as substitutes for natural tissues. Outstanding opportunities are available for development of bioceramics by new synthesis technology. These methods extend our ability to produce materials with tailored chemistries.

The third of these C of E projects is titled: *"Multiphase Biodegradable System to Deliver Bioactive Molecules"* This project will be conducted by Michael Mezei (College of Pharmacy), with Choong Foong in collaboraton with Brian Hall (Biology) Clive Elson St. Mary's and Derek Jones. The goal of this project is to develop and optimize a combined liposomal-chitosan matrix system to deliver bioactive molecules to modulate skeletal and connective tissue growth. Chitosan, a polysaccharide is considered to be nontoxic and bioabsorbable. We will develop a system suitable for use as an implantable biodegradable matrix capable of acting as a slow release vehicle and carrier of specific bioactive organic molecules such as skeletogenic growth factors, bone morphogenetic protein, osteogenic factor extract or corticosteroids. In addition in a different biological application we will investigate the capability of sustained release of a bisphosphonate bone resorption inhibitor. These goals will be supported initially through an *in vitro* study of the mechanism of initiation of osteogenesis and chondrogenesis in embryonic mesenchyme as influenced by the slow release of the bioactive molecules. The matrix material will in addition have the capability to enhance tissue healing and provide hemostasis. Surgical procedures in orthopedic and maxillofacial surgery often have requirements for hemostasis, wound healing, followed by promotion of bone, cartilage or connective tissue growth or repair. Other medical requirements may also call for local delivery of osteoclastic inhibiting agents such as bisphosphonates. Examples being osteoporosis, Paget's disease of the bone and hypercalcemia of malignancy. Additionally the use of osteoclastic inhibitory agents has application in orthodontic procedures to prevent relapse of moved teeth after treatment. -

International Recognition

Dr. Crawford Bain, of the Division of Periodontics recieved an early Christmas present. On October 31, he recieved a letter from the Research Committee and Board of Directors of the Academy of Osseointegration, and the Quintessence Publishing Company (publishers of The International Journal of Oral and Maxillofacial Implants). The letter stated that it is our pleasure to inform you that your article co-authored with Dr. Peter K. Moy and entitled "The Association Between the Failure of Dental Implants and Cigarette Smoking" has been awarded the second Quintessence Pub.Co. Osseointegration Foundation Research Award for Best Paper Published in *IJOMI* in 1993. However, that is not all, the award also included a check in the amount of US$2,000. This will be presented to Dr. Bain at the 10th Annual Meeting of the Academy of Osseointegration in Chicago in March 1995. Crawford has also been invited to make a presentation of his research at the meeting. The editorial board of *IJOMI* has also allocated up to $500 to defray Crawford's travel expenses to Chicago. The Dental Research News congratulates Crawford on this achievement which brings credit to our Faculty and to Dalhousie University.