



Dental

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Research News

Fifty Not Out Research Development Office, (902) 494-1675



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Fiftieth edition



Research Grant Success

An MRC University/Industry grant worth over \$500,000 has been awarded to the Faculty of Dentistry in collaboration with colleagues in the Faculties of Science and the University of St FX.

Project:- 'Glass Ionomer Cement Biomaterials'.

Participants:-

- D. W. Jones, J. C. T. Kwak,
- E. J. Sutow, D. A. Pink,
- D. B. Clarke & T. S. Cameron.

Since this is our 50th edition it is appropriate that the research funding is provided 50/50 between MRC and industry.

Record Number of Abstracts

A total of 17 abstracts have been accepted for presentation at the AADR meeting in Boston in March 1992. A further 20 have been submitted for the IADR meeting in Glasgow. This could give us a possible all time record total of 37 for these two meetings. A further record 25 papers have also been accepted for the AADS meeting. A possible total for the 3 meetings could be 62. Our total of AADR and IADR abstracts presented or submitted to date now stands at 202. The average for the past 5 years could reach an incredible 141, averaging 28.2 per year.

Fifty



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Fifty

MRC Strategic Plan

Under the new President Dr. Henry Friesen, the Medical Research Council has initiated a major planning exercise that will result in the production of a strategic plan by June 1992.

The aim will be to identify major questions, challenges, opportunities and priorities with which the research community will need to face and deal with in the coming years. Considerations will be given to the balance of support between:-

Operating Grants and Training Awards; individual versus large groups of investigators. Other issues to be considered are:- The importance of excellence and stability. The establishment of research priorities. Opportunities for partnerships with the private and public sectors. The relationship of MRC to government and the public. The broadening of the mandate of MRC to include research on the cost effectiveness of health care delivery. The role of MRC in both national and international health contexts, and specific linkages with NIH. These topics are of particular interest to our scholarly activities in dentistry. Policy decisions developed as a result of this exercise can have a significant effect on the availability of research funding in the future. Some members of our Dental Faculty

together with colleagues in other faculties departments and institutions have chosen to opt for the group research concept rather than pursuing the role of individual research. In addition some of our recent grant applications have aimed to undertake partnerships with the private sector. With limited funding available to the research community this difficult route is one which we may have to increasingly rely on in the future. One suggested new area of research support for MRC which may be of particular interest to many of our clinical faculty members is that of 'Cost Effectiveness of Health Care Delivery.' In addition the potential for linkages to NIH offers further potential for innovative collaborative research initiatives. Those interested in international health care issues may also find some value in the suggested broadening of the MRC mandate. The RDO would like to put together a recommendation of support for some of these issues to forward to MRC. If you feel strongly about (for or against) any of the above topics or if you have additional topics which you feel are more important, why not write to the Dental research News and share your views with your colleagues. Such views can also form part of a communication to MRC.

Cancer Pathogenesis

The interesting field of research in which Robin Howell works involves understanding the molecular origins of cancer. Interpretation of the molecular mechanisms of cancer is an important area of research within the Faculty of Dentistry. According to Robert Weinberg "the proliferation of normal cells is thought to be regulated by growth-promoting proto-oncogenes counter-balanced by growth-constraining tumor suppressor genes." Weinberg writing in 'Science' (254:1138 Nov. 1991) has stated that "for the past decade, cellular oncogenes have attracted the attention of biologists intent on understanding the molecular origins of cancer. As the present decade unfolds, oncogenes are yielding their place at centre stage to a second group of actors, the tumor suppressor genes, which promise to teach us equally important lessons about the molecular mechanisms of cancer pathogenesis." According to Aaronson (Science 254:1146, Nov. 1991) "oncogenes identified by a variety of approaches have been shown to function at critical steps in mitogenic signaling. Progression through the cell cycle requires the coordinated actions of members of two complementary classes of growth factors,

and oncogenes appear to replace the actions of one set of these growth factors." Solomon *et al* (Science 254:1146, Nov. 1991) have defined cancer as "a progressive series of genetic events that occur in a single clone of cells because of alterations in a limited number of specific genes." They further state that Identification of additional mutated genes through other chromosomal abnormalities will lead to a more complete molecular description of oncogenesis."

The work of Robin Howell has shown that four patients were constitutionally heterozygous at the c-Ha-ras-1 locus and that the tumour from one patient had lost that heterozygosity. The loss of c-Ha-ras-1 alleles was said to provide a useful marker for detecting deletions of genetic material located on the short arm of chromosome 11 (11p) this has been found in association with a number of malignant tumours. However, the work of Howell *et al* (J. Oral Pathol. Med. 18: 79, 1989 & J. Oral Pathol. Med. 19: 301, 1990) was the first to describe this in association with carcinoma of the head and neck. Robin Howell's work has indicated that the mechanism may contribute to the development of oral squamous carcinoma.

The Goal of High Achievers
According to Diane Lapkin "A great deal of research has been done on the characteristics of peak performers. "Findings reveal that these individuals harbour high feelings of self-worth, self-liking and self-acceptance. In addition, they are individuals who accept total responsibility for these actions and for the consequences of these actions." Lapkin further states that "what is most striking in terms of the research on high achievers, however, is the fact that they see systematic, habitual goal setting as critical for obtaining a high level of performance, motivation, and achievement."

Have you made a new years resolution? Have you set your goals for research for the next five years? Think about it!

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Make Careful Records!

The very first volume of the Journal of Dental Research published 73 years ago in 1919 had a paper by C. B. Davenport, Director of Eugenics, Carnegie Institute, Washington, Cold Spring Harbor, L.I. The author called attention to the fact that "a large group of dental abnormalities has primarily an hereditary basis." He alluded to a number of such abnormalities, and urged dentists interested in dental research "to make careful records of the variations from the normal that are found in the

teeth and particularly, to study familial peculiarities in them." "It is hoped," he said "that thus an interest will be developed in the study of genetic factors and that a solution will be secured of some problems that have troubled the dental profession." One dental graduate who took this plea to heart several years later was Mike Cohen who clearly is a high achiever. Mike rapidly established himself as one of the world's leading authorities in genetic abnormalities. However, Mike's expertise is very comprehensive and is in no way limited to the dental field.

Chance

"Chance favours the prepared mind"
Louis Pasteur

NIH Budget

The 1992 appropriations for the National Institutes of Health has been announced by a House-Senate committee. This has yet to be passed by the Congress and sent to the President. The suggested budget for dentistry is \$160.5 million, this compares with \$1989.3 for cancer and \$1,199.4 for Heart, lung and blood research.

"Education is the best provision for old age"

Aristotle.

SURVEY OF RESEARCH FOR 1973

Nineteen years ago in 1973, Dr. A. P. Angelopoulos of Dalhousie University, Faculty of Dentistry chaired a CDA Committee which conducted a survey of research in the faculties of dentistry in Canada. The survey reported that 84% of the Dalhousie Faculty responded to the questionnaire. It was reported that of the 16 individuals who responded, 11 stated that they were actively involved in research. This compared to 32 active researchers at the University of Toronto, 21 at Western Ontario and UBC and 20 at Manitoba. Dalhousie was ranked seventh in terms of the number of those said to be actively involved in research. Nine of the 11 individuals claimed to spend between 1 and 30% of their time on research and only 2 claimed to spend between 31 and 75% of their time on research. The total MRC research funding for the 10 faculties of dentistry was \$464,002. Toronto had the lion's share with \$159,000 with Manitoba second with \$115,000. Dalhousie was just ahead of bottom placed Laval with a total of \$5,250. The Health and Welfare funding total was \$271,950. Dalhousie was placed fourth in the listing of Health and Welfare funding with \$42,000. This DNHW funding was credited to B. P. Kearney. Dalhousie's five year total between 1968 and 1973

obtained from MRC was given as \$12,000. Toronto had a total of \$391,300 and Manitoba \$207,790. Only Laval and Montreal had less than Dalhousie.

The survey reported on the amount of research space available in the 10 faculties. Alberta was said to have the most space with 10,050 square feet. In terms of space, Dalhousie was ranked eighth out of the ten faculties with a total of 2,400 square feet just ahead of Laval with 1,000 square feet and Saskatchewan with 950 square feet.

Scientists in Demand

The US will be short of about 500,000 to 1,000,000 scientists by the year 2,000. according to a House of Commons Committee (Oct. 30th 1991). Given the lack of research funding and the first rate facilities in the US, some of our brightest and best scientists will continue to flee south unless this country gets serious about research development. Surprisingly, Canada has produced 4 Nobel laureates in Chemistry in the past two decades. Distressingly, all but one (John Polanyi at the University of Toronto) are working in the US.

Choice

"Righting the perceived wrongs of women has become a career choice, like dentistry."

George Jonas

Research Funding Obtained

Research funding obtained from federal agencies over the past 32 years by our Faculty has steadily increased even when we take into account the inflation during this period. The success of our University/Industry MRC grant is very encouraging at a time when the economy is not at it's best and federal research funds are also much harder to come by. The Glass Ionomer Cement Biomaterials grant also has an encouraging aspect of collaboration with colleagues in the Faculty of Science and St. FX.

It is important at Dalhousie that we work together to achieve success. Our Faculty have a further six grants which are under review by federal agencies. News on these other grants will be known in April and June. These grants should bring in a further \$2.34 million if they are successful.

Research Funding 1959-92

Date	Agency	Amount	Discipline
1959	NRC	\$2,350	Oral Surg
1960	NRC	Not Known	Perio
1969/71	MRC	\$14,000	Oral Biol
1972/74	MRC	\$15,000	Oral Biol
1976/78	MRC	\$60,000	Biomater
1979/80	NHRDP	\$28,218	Oral Biol
1979/81	MRC	\$55,042	Biomater
1982/84	MRC	\$108,433	Biomater
1985/88	MRC	\$170,802	Biomater
1986/89	MRC	\$125,102	Biomater
1988/91	MRC	\$712,591	Prog. Grt
1989	MRC	\$18,333	Prog. Grt
1989/90	NHRDP	\$141,872	Ped.Com
1991/92	MRC	\$169,700	Prog. Grt
1991/92	NHRDP	\$120,080	Ped.Com
1991/95	MRC	\$743,156	Oral Biol
1992/95	MRC/Ind	*\$557,265	Biomater
		*Estimate	
TOTAL		*\$3,041,854	

It is interesting to note that over 81% (\$2.5 million) of this federal funding has been obtained in the past 3 years. However, our research productivity should not be measured in terms of research dollars alone. Many types of research do not require vast amounts of funding. Indeed many research projects can be conducted without any funding at all. It is time not money which is the main cost for the development of productive scholarly and research activities. Block allocation of teaching time and research time are crucial. A research career cannot be developed on isolated one day a week time allocations. However, as university scholars we should also realize that we do not work from 9:00 am to 5:00 pm. each day and take six weeks summer holiday each year. A solid commitment and investment of additional time is required in order to develop a meaningful research career.

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**Don't forget the
 Dental Faculty Lunch
 Time Series of
 Research Presentations**
 being held on
 Wednesdays 12:30 to 1:30.
*Look out for the announce-
 ment of topics and location
 posted on the Research
 Notice Board.*

**Abstracts Accepted for the
Boston Meeting**

The following individuals from our Dental Faculty will be presenting papers at the AADR meeting in Boston in March 1992. (Note:- The specific details of these papers were presented in the October and November editions of the DRN)

- Andrews, C.
- Boran, T.L
- Chiarot, M
- Delorey,L. M
- Foong, W. C
- Gerrow, J. D.
- Harvey, A. T.
- Ismail, A. I
- Jones, D. W
- MacDonald, R. M
- Macinnis, W. A
- Mojgani, M
- Power, N. L
- Rizkalla, A. S
- Robinson, A
- Sutow, E. J

It is encouraging to note that five undergraduate students are among the individuals who will be presenting papers, in addition to one Perio-Post graduate student. This rich experience will be very valuable in the development of their future careers.

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Tree-mendous Enterprise
The Dental Research News was once accused of wasting trees by publishing research information each month. The following words provide a little comfort for the editor and publisher. "if for every tree that is cut down a minimum of one new tree is planted, the future of the enterprise is assured. However, until it is cut into boards, the tree is of no real use. Similarly, each bit of basic scientific information may appear to be of no real use until an application is found. Inevitably, however, the tree will be cut into boards and the basic science information will find application. As we cultivate our forests, so must we also cultivate our body of basic science. If we fail to do so, we shall sooner or later exhaust the resource, and development will grind to a halt."

De Witt Stetten, Jr.

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**Billions of Reasons for
Research**

Haroun Shah and Saheer Gharbia have billions of reasons to be doing research in their lab on the 4th floor of our dental building. Between 50 billion and 100 billion bacteria and other organisms are breeding, jostling and pushing for space in our mouths. It is due to the presence of these little companions who share our body that we have dental disease and a Faculty of Dentistry.

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Collaboration

Interdisciplinary research consists of a team of experts from two or more allied fields working together on a research project. In contrast multidisciplinary research involves individual contributions from experts in separate disciplines. In our collaborative biomaterials research programme we have a mixture of both of these taking place. "Members of an interdisciplinary team may have to face the probability of not being rewarded in their respective fields for work outside traditional boundaries. Their work will be received best by a new audience that belongs to neither parent discipline."⁽¹⁾

"Almost every scientist recognizes that interdisciplinary research can produce major advances."⁽²⁾ However, working as a team is not easy, it requires a considerable amount of understanding by the members involved.

"Disciplinary training tends to establish a bias in favour of the methodological paradigms of that discipline, making cross-disciplinary work fundamentally difficult".⁽³⁾ However, individuals on research teams whose backgrounds and formal training are in different areas, can contribute important new perspectives and insights. A classic example is the determination of the DNA

structure by Watson and Crick who were both physicists.

"Breakthroughs often occur at the margins of fields rather than at their cores, and often these frontiers overlap with boundaries of other disciplines."⁽⁴⁾

The MRC budget has increased four fold in the 15 years from 1976 to 1991 (\$50.8 Million—\$215.5 million). During this period the number of collaborative research programmes funded by MRC has increased. However, the % of the MRC budget allocated for such programmes has remained at about the same level of 15%.⁽⁵⁾ A total of 40 MRC Programme grants were being funded in 1990-1991, with a total budget of \$11.8 million. In contrast a total of 13 MRC Group Grants were funded in 1990-1991 with a budget of \$14 million. "Programme Grants...have been shown to be an excellent tool for the promotion of multidisciplinary or interdisciplinary approaches....they have provided an excellent milieu for the training of graduate students."⁽⁵⁾

(1) Thoughts on Interdisciplinary Research, Stein and Jessop. J. Clin. Epidemiol. 41: 813-815. 1988.

(2) The Blocks on Interdisciplinary Research, F. Watt, New Scientist, 130: 1763, 1991.

3) Cross-Disciplinary Research, Editorial, Environ. Sci. Technol. 22:987, 1988.

4) A New Agenda for Science, J. Sommer, American Scientist, 75: 222-223, 1987.

5) Medical Research Council, Report of the President 1990-91.

Importance of Research Funding for Nova Scotia

Following receipt of the news that we had been successful in obtaining a research grant of well over \$500,000, it brought home to us that research funding is an important component in the economy of the region. The acquisition of over \$1.5 million in research funds during the past 11 months by our Dental Faculty at Dalhousie University, represents a unique and special form of transfer payments into the province. The importance of research grants to Dalhousie University and to the Halifax-/Dartmouth region can be judged by the fact that some 400 full and part time research personnel at Dalhousie University are supported by grant and contract funding awarded to faculty members each year. The significant point is that these funds have been brought into the region from outside federal and private agencies and industrial sources. The average annual salaries of individuals supported on external funding is about \$26,000 for a total payroll of some \$10.4 million. These individuals will spend a large proportion of this \$10.4 million in the Halifax/Dartmouth region. Clearly Dalhousie researchers are collectively a major factor in the economy of the region. All too often the universities are regarded as a burden on the tax payer, however, the general public needs to understand and

appreciate Dalhousie University contributes not only to the intellectual and social needs of the region, but also makes a significant contribution to the economy. However, although the dollars which are brought into the region are important, the major contribution of Dalhousie University researchers in all subject areas is that they significantly enrich the quality of life not only in Nova Scotia but in Canada and the world. It is vital for the economy of the region as well as Dalhousie University that we maintain our critical mass of top class international researchers. The recognition of Dalhousie as a major international research university clearly provides an argument for appropriate funding from the provincial government.

Teamwork

Development of our successful MRC University/Industry grant application involving glass ionomer cement materials has been an example in teamwork at its best. The technicians in the biomaterials laboratory and those providing secretarial assistance deserve special thanks. It should also be noted that the teamwork extended through the Dalhousie Technology Transfer Office right up to the Office of the President.

"You might say this is now the age of teamwork, and that there's too much knowledge to digest for a single person to be out there doing what people did in the 19th Century and earlier." David Spurgeon.

Biomaterials

The term biomaterial may not be very familiar to the general public, yet such materials play a very important and significant role in the health care of our modern society. The term biomaterial has been defined as covering all foreign materials such as synthetic polymers, natural polymers, metals, ceramics, natural tissues and composites, which are placed into the body to fulfil a specific task. Applications for biomaterials range from prosthesis fashioned into replacement or support parts for skin, bones, teeth, blood vessels or entire organs, or they may also contain drugs which are released into the body in a controlled manner, the major emphasis being the biocompatibility of these materials. Biocompatibility is the term used to describe the state of affairs when a biomaterial exists within a physiological environment, without either the material adversely and significantly affecting the body, or the environment of the body adversely and significantly affecting the material.

Our biomaterials research group at Dalhousie are working in areas which represent both important clinical needs for improvement and achievable goals from an industrial viewpoint with useful products as an end result. The group, are involved in basic fundamental studies aimed at

understanding the mechanisms underlying synthesis and material properties and behaviours as well as the biological interactions. However, the group are also undertaking studies involving evaluation of current and improved materials which provide base line data.

One such area in which our group is particularly active at the moment is in the synthesis and development of ion leachable glass cement systems. These cements have the capability of chemically bonding to calcified tissues. One aspect of our research has been a study of the crystallization of experimental glass cement forming systems.

We are using differential thermal analysis (DTA) as a technique for studying the kinetics of phase transformations of the glasses which we are synthesizing using wet chemical methods.

The main objective of our investigation was to determine the crystalline phases and kinetics of crystallization for our experimental glass formulations synthesized by a wet chemical method. Crystalline materials are stronger than amorphous glasses. The experimental ion leachable glass formulations have application as cement materials, restoratives and even orthopedic bone cement.

Major Grant Award for Faculty of Dentistry

It is perhaps most appropriate that the fiftieth edition of the Dental Research News should carry the good news of a successful 50/50 matching funds MRC University/Industry grant. This represents the first of this type of grant to be obtained by our Faculty of Dentistry. The 50/50 matching funds are worth well over \$500,000 for a three year period. The project involves six individuals, two faculty members from Dentistry (Jones and Sutow), two from Chemistry (Kwak and Cameron) and one each from Geology (Clarke) and Physics at St. FX (Pink). It is very encouraging to find that our small faculty has the energy, enthusiasm and drive to mount such an aggressive request for research funding. This is indeed a healthy attitude and shows that research is alive and well in the Faculty of Dentistry. However, what is even more encouraging is the fact that it also shows the excellent collaborative research interaction which we have between different departments, faculties and other institutions. Considerable in-depth discussions over a period of six months were required before an agreement was reached allowing for the joint University/Industry MRC grant application to be finalized. To achieve this at a time of economic depression represents a tribute to the quality of our research and to the enterprising entrepreneurial

approach of the industrial partner. This collaboration was finally successful in the matching fund application to MRC, it represents a very major research investment of well over half a million dollars. The Dental Research Development Office wish to acknowledge and place on record the considerable help and assistance received from Mr. Gordon Owen of the University Technology Transfer Office, who has worked so hard to put this complex negotiation into place. We are hopeful that the 3 year research programme will be the preamble to further research collaboration between Dalhousie University and the Industrial Partner. It is anticipated that clinical trials will be a natural follow-up to some of the basic laboratory synthesis and development of improved biomaterials. This University-Industry research programme comes at a good time for Dalhousie University since we are being encouraged by the government to develop closer relationships with industry and to concentrate on research which has an identifiable end use. The project involves Synthetic materials which are being used progressively more frequently in biomedical applications as substitutes for natural tissues. This research is thus increasingly important for our aging population which has a larger proportion surviving into old age.

Derek W. Jones

Assistant Dean