Dalhousie University, Faculty of Dentistry

Dental Research News

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Stimulus & Challenge

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The voice of Dal Dental research

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Research Breakthrough

The Biomaterials Research laboratory are pleased to report that they have achieved success in producing a glass ionomer luting cement formulation which has excellent physical and chemical properties. A major international company has expressed a strong interest in the product. The hope is that the first batch of material will be available for a clinical trial and evaluation during the next 12 to 18 months. The research conducted during the past 16 months has also produced a significant amount of data which can lead to several other cement/base-lining and restorative products. This ion leachable glass cement system is believed to be the first of this type of material to be produced by a wet chemical synthesis method.

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Working on the cutting Edge

Gordon Taylor 2nd year DDS MRC Summer student has had an exciting summer working in the Biomaterials research laboratory. Gordon was involved with a project which has yielded some very interesting and potentially significant results. Gordon's summer project has been concerned with the production of test samples for a series of glass formulations which have lead to the development of a ceramable glass/ceramic material which may have application as a dental ceramic restorative system. This material is synthesized by a wet chemical method developed in the Biomaterials research laboratory. The only negative aspect of the project is the fact that the specific details of the data have to be kept confidential for the time being due to the potential patentability of the new material. However, this has been a most rewarding experience for this Scottish born young man, in his first acquaintance with a research project.

Inventive Leap

The University of Calafornia, Santa Cruz, has recieved an application from a computer program for a patent disclosure for a series of compounds that it has invented. Dr. Todd Wipke is named second to the computer program on the patent application for the invention of morphine analogues. The compounds do not exist in nature, nor have they ever been synthesized, but they could be of interest to pharmaceutical companies trying to produce opioids with fewer side effects. Computer programs can clearly be superior to humans in the process of invention. The main reason for this is that scientists tend to proceed by making small changes to existing phenomenon, which does not encourage inventive leaps. The computer is free from any preconceived ideas and has the ability to visualize three dimensional structures with ease.

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Bill 93- Will provide strong support for research.

Remineralization

A patent has been taken out for a remineralization solution composed of amorphous calcium phosphate which is claimed will prevent tooth decay. The remineralization solution was developed by Dr. Ming Tung of the Paffenberger Research Center at NIST. The amorphous calcium phosphate will be marketed as an ingredient of toothpaste and even chewing gum. This development will provide a wonderful opportunity for our clinical faculty members to conduct *in vivo* clinical trials to validate the effectiveness of the system. In addition the possibility of conducting a wide range of *in vitro* laboratory tests which can be conducted using for example, Tom Boran's artificial caries capability, or simply evaluating the change in indentation hardness of enamel of extracted teeth. The 'Enamelon' product is heralded as the first major scientific and technological breakthrough in the toothpaste industry since the introduction of fluoride in the 1960's. It is claimed that the product will remineralize tooth structure and desensitize sensitive teeth. These claims provide a superb opportunity to validate or disprove the effectiveness of this product. Order your tube today and prevent the decay of your research career.

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Turn to Page 2 to read the good news about CLINICAL RESEARCH.

Clinical Trials

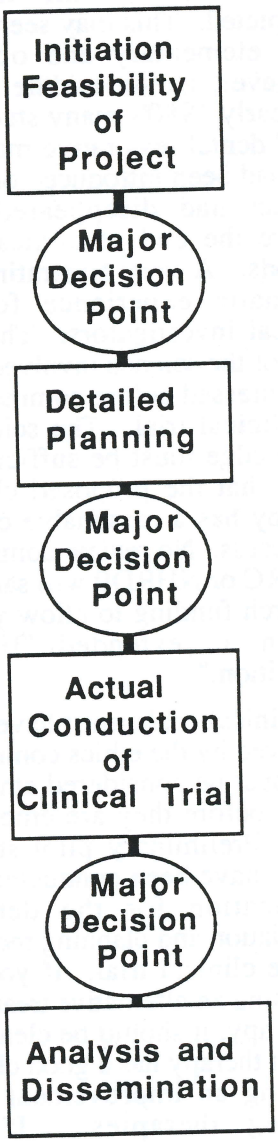
The Research Development Office is pleased to announce a new initiative for the stimulation and development of clinical research. A sum of Alumni funding is to be targeted to support clinical research within the Faculty of Dentistry. The specific details of this initiative will be circulated to departments in the next week or so.

Clinical trials and clinical research have been actively undertaken for well over 40 years in the medical study of cardiovascular and other similar medical disease. During the past 25 years very large-scale prospective randomized clinical trials have been undertaken in the United States. However, prospective randomized clinical trials are less well established as routine procedures in the area of clinical dentistry. The concept of randomization was first put forward as long ago as 1935 by R. A. Fisher (The Design of Experiments, 8th ed. Hafner, New York, N. Y.). Major large-scale clinical trials dealing with coronary drug research, involving hundreds and in some cases up to 12,000 patients have been undertaken in recent years in the United States. Such clinical trials cost many millions of dollars, as long ago as 1982 the NIH was spending some $80 million or 15% of its extramural program budget on clinical trials. One of the questions which has to be addressed is the extent to which these expensive clinical trial programmes compete for funding with other more basic biomedical research which has the capability of producing new information on the etiology and pathophysiology of disease or the development of new procedures, techniques or biomaterials. As the Medical Research Council broaden their mandate to cover questions of heath care delivery we need to ask the question up to what level can investment in clinical trials be justified. Cost will become an increasing decision to be faced by the MRC as they allocate funding to the sectors of the new expanded mandate. To what extent will basic biomedical research suffer in competition for the scarce research dollar? The expectation is that the new broader mandate of MRC will only become a possibility if new additional funding becomes available to adequately support it. If this is not the case, it will deal a devastating blow to basic biomedical research in Canada.

Fortunately, in general, clinical trials in dentistry are on a much smaller scale and are less costly than the major clinical trials such as those involving coronary research supported by the NIH. Even so cost will always be an important factor in decisions relating to the initiation of a clinical trial. MRC or NHRDP committees making recommendations to support an application for a clinical trial will clearly be considering the cost and potential benefits which can accrue from such a trial. Dentistry clearly is at a disadvantage when it comes to competing with potential medical clinical trial applications which may involve life threatening disease and the possibilities for significant cost savings from the public health sector.

The opportunity for clinical testing of a new biomaterial emerging from the biomaterials research program at Dalhousie can allow faculty members to participate in the exciting progression of biomedical research from bench to practice. The dental profession advances through progress in basic and clinical research through clinical trial validation to acceptance in general clinical practice.

The National Heart, Lung, and Blood Institute (NHLBI) in the United States have developed a structured four phase decision process to address the question of clinical trials. This is illustrated in the following diagram.



Although Dental Faculty members may operate in a very different environment in terms of finance and health risk, consideration of this clinical trial decision process may prove to be useful and beneficial when planning to undertake some form of dental clinical trial. It is important to note that the four stage process stages are separated by three important decision points.

The first stage involves an analysis of the feasibility and need for the trial. It is important that the state of the science involved must be stable and not in a state of flux. It is clearly obvious that the technique or concept under test in the trial should not be obsolete or

outdated before the trial is completed. This may seem to be very elementary and obvious. However, in the middle 1970's and early 1980's many studies of 'new' dental restorative materials that had been introduced onto the market had disappeared well before the end of clinical trial periods. A very frustrating and traumatic experience for the clinical investigators. Thus the state of the science involved must be addressed before commencing the clinical trial. The scientific knowledge must be sufficient to show that the proposed clinical therapy has a reasonable chance of success. No review committee of MRC or NHRDP will sanction research funding to allow you to go on an extended "fishing expedition."

All clinical trials must have been reviewed by the ethics committee and must be considered ethically sound before they are embarked upon Preliminary pilot studies should have been conducted as a justification for the detailed formulation and planning required for the clinical trial. If you are proposing an alternative treatment of therapy, it should be clear that the test therapy has a good chance of being an improvement over existing therapies. If the experimental test therapy or procedure is already in wide use the opportunity for changing dental practice may have already passed. In this respect it is also important to consider the need for ready availability of suitable control patients.

A very important aspect of the feasibility of any clinical trial is the assessment of the number of patients required, this will involve decisions relating to the statistical power required and the estimated drop out rate of participating patients. The availability of sufficient numbers of acceptable patients, the cost of the trial, the suitability of the Dental Faculty Clinic facilities or private practice environment, the end points and their assessability as well as the very important issue of randomization all have to be addressed. For example it may not be appropriate to simply assign patients to alternate treatment as they arrive at the Dental Clinic, it is entirely possible that the weather or some external factor may have an influence on patients of a certain age or physical disability who may or may not turn up at the clinic on a specific time or day.

It is most important to ask the question in terms of its feasibility, what will be the potential impact of the clinical trial? How important will the clinical trial be to dental health care? Will the potential benefits to the public be commensurate with the cost of the trial? For the MRC or NHRDP to support the proposal, the clinical trial will have to have the potential to be of importance to dental or biomedical health research and must ideally also validate or extend a hypothesis emanating out of basic research.

During the detailed planning stage the detailed protocol for the clinical trial would be developed. This procedure may involve further pilot studies if required. The third stage involves the actual conduction of the clinical trial, however, during this period issues of efficacy, safety and any advances in the state of the science will need to be continually reviewed. The development of problems identified dealing with safety or efficacy may require the termination of the trial prematurely. The fourth and final stage of the clinical trial occurs following the normal conclusion of the clinical trial involving the follow-up evaluation of patients. This final stage involves analysis of data and most important of all the dissemination of this information to other clinical scientists at CADR/IADR meetings and to the general dental profession and the public at large.

Farewell to John

The Dental Research News would like to wish a fond farewell to John Sterrett, Division of Periodontics. John has relocated to the Medical College of Georgia. John has been an active researcher with our Faculty over many years. In addition to his clinical and laboratory research he is also the inventor of a Pressure Anaesthesia Device for Guiding Needles (US Patent No. 5,171,225). John is a fine example and inspiration to his clinical colleagues who wish to aspire to developing a research career. We wish John well in his new location.

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The Real Cost

As we contemplate the problems of conducting our research programmes in the absence of adequate funding we should perhaps take note of the following words of Ogden Nash.

"Certainly there are lots of things in life that money won't buy, but it's very funny—Have you ever tried to buy them without money"

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Data Analysis

New "Data Desk 4.1" for Apple Macintosh. This latest version of data-analysis software includes popular non-parametric test procedures, new regression diagnostics, and dynamic lagging function; a notebook feature provides place to record history of analyses, including comments, plots, and tables: Cost $595. Information from:- [Data Description Inc., PO Box 4555, Ithaca, N.Y. 14852; (607) 257-1000.]

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Opportunities for Educational Research

"Connecting theory to practice is more than examining instructional effectiveness or devising new forms of professional development. It also means placing research in the service of teaching and school improvement."

Research and the Renewal of Education, 1991, Thomas James, *et al.*