



# Dental Research News

DECEMBER 1991

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Grants



## Happy Researching for 1992



Publications



**This Was The Year That Was!**  
 As 1991 draws to a close we can look back and say that our research activity and research efforts within the faculty during the past year were exceptional as measured by any standards. We have received for the first time an MRC Development Grant to support the work of Dr. Haroun Shah. The establishment of Haroun Shah's Microbiology Research Laboratory represents a major research expansion for our Faculty. We have received over a million dollars for research in 1991. Our success in negotiating and submitting a large MRC University/Industry Grant for 1992 is a major achievement. We have submitted a record number of grant applications to MRC and NHRDP worth a further \$3.63 million. The number of papers submitted to the AADR and other research meetings together with anticipated further submissions

to the IADR in Glasgow will produce an anticipated record number of our papers being read at international meetings. In addition we have a large number of AADS papers which are to be read at the meeting in Boston next March. Never before in the 81 year history of the Dental Faculty have we had such a volume of research funding, with so many of our members involved with genuine scholarly and research activities.

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

What weighed 36.8 Kg, had a potential value of \$1,780,297, had approximately 30,000 pages and flew to Ottawa on the 30th October?

Answer on Page 2

Derek W. Jones  
 Assistant Dean

## Canada-German Research Grant Application

An application has been made to Canada Council for a research grant under their Canadian-German Research Award programme. This will provide up to \$95,000 to fund a German academic to come to Dalhousie. A proposal has been made that Dr. Joachim Viohl pay a twelve month visit in 1993 to Dalhousie University. He will be involved with our ongoing research programme in biomaterials. In addition it is hoped that Dr. Viohl will be participating in our Research Seminar series and will be giving some lectures to our undergraduate and graduate students as well as faculty members.

Dr. Viohl is a celebrated and distinguished German Dental Biomaterials Scientist and Clinical teacher. Professor Viohl is Vice-Dean and served for one year as Dean of the Dental School at the Free University of Berlin. Dr. Viohl has published 116 scientific papers and chapters in books. He is recognized as a distinguished scholar not only in his own country but internationally. He also has international recognition for his outstanding work on ISO Standards for dental materials. We are pleased that the Canada-Germany Research Award gives us the opportunity for a distinguished scholar such as Dr. Viohl to possibly pay us a

visit. The plan is that he would start his visit in early 1993. We are sure that if this grant application is successful the collaboration and interaction will be extremely valuable and enriching for our research programme and will also be very beneficial for Dr. Viohl

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### Answer to Trivia Quiz

Twelve copies of our Biomaterials MRC Programme Grant Application.

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### Not So Trivial

What weighs twice as much as twelve copies of our Biomaterials MRC Programme Grant and flies to Detroit in February. Sadly the answer is one of our Clinical Researchers, 'Bruce Graham.' The Research News on behalf of Faculty wish Bruce well in his new role and perhaps we should shed a tear as he as he leaves us for his mission of Mercy.

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### Measured Thoughts!

"Until a phenomenon can be measured it cannot be understood."

Lord Kelvin.

"The most important book in biology is Darwin's 'Origin of the Species' and there are no measurements in it."

J. B. S. Haldane

"If a thing exists in some amount it can be measured"

Max Hamilton

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The following paper was published in the Journal of General Microbiology page 5, Volume 137, 1991.

**Pathways of glutamate catabolism among Fusobacterium species**

by

S. E. Gharbia & H. N. Shah

**ABSTRACT**

Glutamate is a major source of energy for *Fusobacterium* species but its mode of catabolism has not hitherto been elucidated. Cell suspensions of *F. nucleatum* and *F. varium*, as representative species from the oral cavity and gastrointestinal tract, respectively, both decarboxylated position-labelled glutamate but by different pathways.  $^{14}\text{CO}_2$  was released only from C-5 by *F. nucleatum* whereas *F. varium* decarboxylated glutamate at either C-1 or C-5. In both species, 2 mols of glutamate fermented yielded 2 mols of acetate and 1 mol of butyrate, suggesting the possibility of three metabolic pathways: the 2-oxoglutarate, mesaconate and 4-aminobutyrate pathways. Enzymes representative of the three pathways were assayed for in cell-free extracts of fusobacteria. All species tested possessed high levels of both glutamate dehydrogenase and 2-oxoglutarate reductase, indicating the presence of the 2-oxoglutarate pathway. Enzymes representative of the mesaconate pathway were detected in *F. sulci*, *F.*

*ulcerans*, *F. mortiferum* and *F. varium*, while the latter two species also possessed the 4-aminobutyrate pathway. The pathways of glutamate catabolism therefore bore no relationship to the site of isolation of the fusobacteria tested but instead correlated with their chemotaxonomic properties. Thus, *F. varium*, *F. mortiferum*, *F. ulcerans* and *F. sulci*, which possess a peptidoglycan structure based on diaminopimelic acid, have either two or three pathways for glutamate catabolism whereas *F. nucleatum* and other species that have a lanthionine-based murein metabolized glutamate solely by the 2-oxoglutarate pathway.

**Hindsight**

"Retrospective recognition of the value of good science is often much easier than trying to predict its value from research proposals."

Robert Genco

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**Breakthroughs**

"Although the analysis has not been done, I contend that dental research has as many breakthroughs *per* 100 scientists as any biomedical research area, and we should be proud of these breakthroughs."

Robert Genco

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**Have You Any News Items for the Research News?**

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**London Linkage\$  
MRC GRANT AWARD  
(Dalhousie and the  
University of London)**

Even though Haroun Shah has now travelled 3,000 miles across the Atlantic to join us at Dalhousie he managed to have one final parting shot. He was successful in a joint application for an MRC (UK) grant. This will enable Haroun to continue collaborative research with colleagues in London, UK.

Dr's. H. N. Shah and K. Brocklehurst (University of London) have recently been awarded £65,362 (approximate. \$131,000) by the MRC (UK) for a two-year operational grant entitled "Characterization and physiological function of proteinases produced by key periodontal pathogens." The grant supports a postgraduate research assistant (who will be based in London but will work periodically in Dr. Shah's laboratories at Dal) and a technician. The grant which was put together by Dr's. H. N. Shah, S. E. Gharbia and K. Brocklehurst was based largely on their successful isolation and characterization of the major proteinase virulence determinant (gingivain) of the key periodontal pathogen *Porphyromonas gingivalis*. The project seeks to undertake studies on the molecular recognition characteristics and active center chemistry using stopped-flow kinetic analysis

and specially designed time-dependent inhibitors as reactivity probes. Initially the applicants will concentrate on *P. gingivalis* but will subsequently extend the study to include the proteinase, of the spirochaete *T. denticola*. The latter microorganism (which Dr. Gharbia has been working with during the last year) has been successfully cultured by only five or six laboratories around the world. All work relating to the physiology and metabolism of the enzymes will be developed at Dal and should help elucidate major aspects of the complex microbial interactions that occur subgingivally. This in turn should lead to the development of strategies for the control of one or more of the processes involved in the maintenance of periodontopathic species and permit, in the long term, the elimination of specific species from this ecosystem.

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**How the World Works**

"Science is a way of thinking much more than it is a body of knowledge. Its goal is to find out how the world works, to seek what regularities there may be, to penetrate to the connections of things - from sub-nuclear particles, which may be the constituents of all matter, to living organisms, the human social community, and thence to the cosmos as a whole."

Carl Sagan

### Helsinki Bound

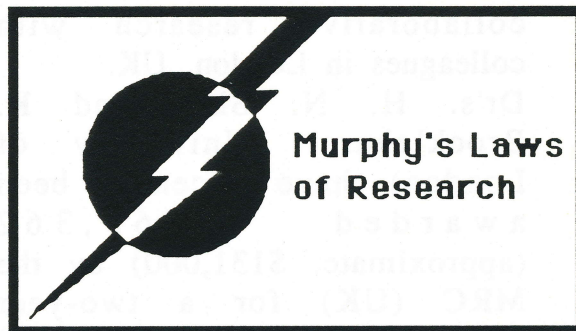
Dr's. Shah and Gharbia are participating in a Symposium on Oral Microbiology, January 31-February 1, 1992, in Helsinki, Finland. They are presenting two papers at the meeting:

#### Physiological Properties of Subgingival Plaque

by H. N. Shah and S. E. Gharbia.

Physiological changes that occur subgingivally are likely to have a profound effect on the process of disease development. Because of the physical inaccessibility of these sites, direct analysis remains a distant goal. *In vitro* experiments must therefore be designed and interpreted against a background of the chemical properties of this ecosystem. A survey of the physiological properties of subgingival plaque bacteria indicate that nearly all species are non/weakly fermentative. Consequently nitrogenous substrates are catabolized for energy assimilation. Of these (acidic) anionic and basic (cationic) amino acids such as aspartate and glutamate are key fermentable substrates and also comprise over 50% of the free amino acids of dental plaque. Peptides are, however, the favoured substrates for growth of *P. gingivalis*, *F. nucleatum* and *T. denticola*. Peptides of ca 10-14 residues long are rapidly incorporated by these species and during

active transport suppresses the uptake of free monomers. The kinetics of uptake are complex and vary with the concentration of the amino acid composition of the heteropolymer. These peptides, released by the action of hydrolytic enzymes, are likely to increase as disease progresses.



22) Have you noticed that just as you are about to publish that clinical research report on a specific commercial item the company takes the product of the market.

#### More Abstracts

An abstract has been submitted to the European Academy of Osseointegration Annual Meeting, Brussels, Feb. 1991:

Factors Influencing the Prognosis of Dental Implants. Moy P K. and Bain C. A.

An abstract has also been submitted to American Academy of Periodontology, Orlando, Florida, Nov.1991:

Factors influencing implant failure. Bain, C. A.

The second paper being given in Helsinki, Finland is:-

### Gingivain a Cysteine Proteinase

by

H. N. Shah<sup>1</sup>, S. E. Gharbia<sup>1</sup> & P.A. Lawson.<sup>2</sup> Department of Oral Biology, Dalhousie University.<sup>1</sup> Department of Oral Microbiology, The London Hospital Medical College<sup>2</sup>, London, UK.

Much of our understanding of the role of dark pigmented anaerobic rods in the aetiology of periodontal diseases stems directly from an appreciation of the taxonomic complexities of these microorganisms. Heterogeneity among dark-pigmented strains, originally placed in one species, *B. melaninogenicus*, was first reported in 1976 (Shah *et al.* J. App. Bact. 41, 473). Following a series of chemotaxonomic analyses, 10 species are now recognized, 3 of which belongs to the genus *Porphyromonas* while the remainder have been assigned to the genus *Prevotella*. Current 16S-rRNA sequence data corroborates the chemotaxonomic features of these species. *P. gingivalis* is considered the most important periodontal pathogen. Virulence of this species is undoubtedly multifactorial but particular attention has been focused on the proteinases which are generally considered to be trypsin-like. We have

recently purified the extracellular proteinases of strain W83 and using a variety of techniques shown it to be a cysteine proteinase for which we proposed the name 'gingivain'. Gingivain has several functions including disruption of the basement membrane of epithelial cells, lysis of erythrocytes and probably plays a key role in supporting the nutritional network of subgingival plaque bacteria.

The authors of these Helsinki papers would like to acknowledge support from MRC Grant No. 9009DG-20550.

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Yet Even More Abstracts

Dental Research News has learnt of a further two abstracts submitted for the AADS meeting in Boston.

Implant Surgery— The Learning Curve - Wave it Goodbye!  
C. A. Bain and P. K. Moy.

Introduction to Dentistry; a micro-teaching unit for beginning dental students.  
C. A. Bain

Abstracts were also submitted to Academy of Osseointegration Meeting, Vancouver, Feb. 1991:

Factors Predisposing to Implant Failure. C. A. Bain

Effects of Smoking on Failure Rates of Dental Implants.  
C. A. Bain and P. K. Moy

### Mary in Print

Congratulations are due to Mary McNally our fourth year dental student who is first author on a scientific paper published in the Journal of Nutrition. The title of the paper is:-

#### **"Contribution of Sulfate and Sulfoesters to Total Sulfur Intake in Infants Fed Human Milk."**

M. E. McNally, S. A. Atkinson\* & D. E. C. Cole, Dept. Pediatrics & Pathology, Dalhousie, & \*Dept. Pediatrics, McMaster.

**ABSTRACT:** Colostrum (d 2-4) and mature human milk samples collected from eight mothers giving birth at  $31 \pm 7$  wk. of gestation were analyzed for total sulfur, free inorganic sulfate and acid labile sulfoesters. The data presented are representative of complete 24-h expressions. Total sulfur was measured using a wet digestion procedure in which all forms of sulfur were converted to inorganic sulfate. The sulfate was quantified by a radiometric barium precipitation assay. Total sulfur showed no marked diurnal variation, but the mean concentration in 19 colostrum samples ( $10.2 \pm 4.2$  mmol/L) was significantly higher than in 14 mature milk samples ( $4.3 \pm 0.8$  mmol/L) ( $P < 0.001$ ). The range of predicted 24-h intakes of sulfur by infants fed colostrum (0.78-3.22 mmol/kg body weight) was slightly higher than those

fed mature milk (0.54-1.06 mmol/kg), but it was not significantly different. The combined fractions of free inorganic sulfate and acid-labile sulfoester fractions contribute <5% to the total sulfur content of either colostrum or mature milk. However, the physiological significance of these milk components remains to be determined. J. Nur. 121: 1250-1254, 1991.

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**Intellectual Integrity**

"For centuries knowledge meant proven knowledge - proven either by the power of the intellect or by the evidence of the senses. Wisdom and intellectual integrity demanded that one must desist from unproven utterances and minimize, even in thought, the gap between speculation and established knowledge."

Imre Lakatos

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**Christmas Wish!**

