

A Microbiologist in the World of Dentistry

Dr. Daniel Grenier is a professor at Laval University's faculty of dentistry. He is also the director of the Oral Ecology Research Group, a research centre based at Laval. In this month's *JCDA*, Dr. Grenier contributes an article on the potential benefits of probiotics for oral health (see p. 585). *JCDA* spoke with Dr. Grenier to learn more about his research and his experiences as a microbiologist working within a faculty of dentistry.

JCDA: *You are a professor at the faculty of dentistry at Laval University, yet your formal training is not in dentistry. How did you become involved in the field of dental research?*

Dr. Daniel Grenier: It all began with my undergraduate studies in microbiology. I was offered a research internship at Laval University's faculty of dentistry through a grant from the Medical Research Council of Canada (now the Canadian Institutes of Health Research). For a microbiologist, the oral cavity represented a perfect study model, given the impressive diversity of microorganisms found in the mouth. In the 1980s, knowledge in oral microbiology was still embryonic, so becoming involved in dental research would allow me to contribute to the developing knowledge base on a problem affecting a large proportion of the population, and possibly make my mark. Over the course of my career, I worked

with some of the most active microbiology researchers in Canada, who were role models and who instilled in me a passion for oral microbiology and oral health.

JCDA: *Are there any specific benefits or challenges working within a faculty of dentistry?*

Dr. Grenier: For an oral microbiology researcher, working within a faculty of dentistry is extremely beneficial because this environment allows me to have direct contact with clinical professors and students who are dealing with actual problems encountered in the clinic. The discussions that take place help my team and I modify our ongoing projects or initiate new ones to better address the oral problems affecting people.

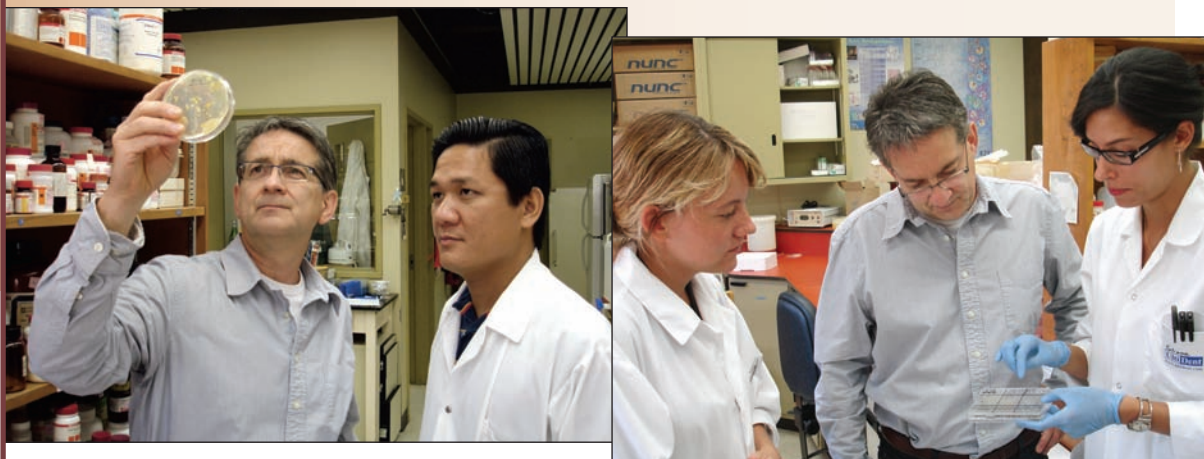
Working within a dental faculty also gives us an opportunity to use the results that we obtain through basic research to develop projects with a clinical scope in order to verify our theories. We benefit from having access to many samples due to the large number of patients that come to the clinic. Finally, through graduate programs such as the periodontics program at Laval we are able to create a multidisciplinary team that includes students in basic sciences as well as clinical dental students.

My greatest challenge is trying to show young dentists in training all the positive aspects of a career in research. My goal is to identify highly motivated students and convince them to become involved in research early in their studies, because they will become the next generation of dental researchers.

JCDA: *You have been the director of the Oral Ecology Research Group since 2000. What are the group's current studies or areas of research? Is your team comprised mainly of dentists or general scientists?*

Dr. Grenier: The Oral Ecology Research Group was created in 1989 by Luc Trahan, a professor in the faculty of dentistry who had a longstanding involvement in dental research. We are one of the few research centres at Laval that has managed to retain its accreditation for 20 years.





Dr. Daniel Grenier with 3 members of his research team (from left), post-graduate researcher Dr. Vu Dang La, doctoral student Ms. Laetitia Bonifait and post-graduate researcher Dr. Juliana Santos.

The group currently includes 9 professor members, who must devote at least 50% of their workload to research: 5 from the faculty of dentistry, 3 from the science and engineering faculty and 1 from the faculty of dentistry at the University of Montreal. Most of the members are basic researchers; only 1 member is a clinician. The group also includes approximately 25 graduate students and 5 postdoctoral students and associate members. Our challenge in the coming years will be to convince young professors joining our faculty to become involved with our research centre and in our research activities.

The group's activities encompass 3 main research themes. The first involves everything to do with oral ecology and oral infections. Here we marry the basic sciences (microbiology, biochemistry, immunology) to the clinical and more applied contexts of dentistry. Among other things, we are interested in the etiology of oral infections and we are trying to identify therapeutic targets for prevention and treatment. Within that area we are also studying the systemic consequences of periodontal disease, particularly the link to premature births and preeclampsia. Oral infections were long considered to be confined to the mouth, but we now know that what happens in the oral cavity has repercussions on the patient's overall health.

Our second theme deals with infection control in dental offices. We are interested in the risks that may be associated with bioaerosols generated during dental treatments and the contamination of dental unit waterlines. Our goal is to reduce the

risks of transmitting infections in dental clinics as much as possible.

Our third research theme is more recent and came about as a result of our expertise in the fermentation of sugars by cariogenic bacteria. We applied this knowledge to other bacteria, notably the lactic bacteria used in the dairy industry. With the help of molecular biology, researchers are working to develop bacteria that are more effective and resistant to the bacteriophages that can infect them, potentially leading to significant economic losses for the dairy industry.

JCDA: *In your opinion, how important are international collaborations? What are the benefits and challenges of such collaborations?*

Dr. Grenier: Any collaboration, whether international or not, is very beneficial in research. My research activities have progressed more quickly thanks to collaborative efforts that allowed me to acquire various research tools such as human cell lines and bacteria carrying mutations, or to benefit from cutting-edge technologies and equipment that were not available at our centre.

As for international collaboration, I have established many contacts in the last 12 years with researchers in Japan, particularly at the faculty of dentistry at the University of Tokushima. Over the years we have published about 15 articles together, and 3 postdoctoral researchers have done internships in my laboratory.

More recently, I developed a partnership with a team of chemists in Italy who are working on

isolating molecules from plant extracts. After reading some of my publications, they contacted me to find out if I would be interested in using my study models to evaluate the therapeutic potential of their molecules for oral infections. Two Italian doctoral students joined my laboratory last year to initiate this collaboration, and we have recently received a research subsidy from Quebec's Department of Economic Development, Innovation and Export Trade for this project.

JCDA: *With over 150 peer-reviewed articles to your credit, what do you hope that dentists, or members of the public, can take away from your research?*

Dr. Grenier: For a long time my research focused on fundamental elements aimed at developing a better understanding of the mechanisms associated with the pathogenesis of oral infections. In particular, these studies allowed me to identify therapeutic targets for the development of new medications or oral hygiene products.

As circumstances would have it, part of my research for the last 4 or 5 years has involved more clinical applications and I realize that the profession as a whole and more individual dentists are interested in my work. More specifically, I am trying to demonstrate the therapeutic potential for periodontal diseases of natural substances like polyphenols isolated from cranberries and licorice. I hope that one day some of these substances will be found in oral hygiene products or used in certain treatments for patients. This is a long-term

project, but everything is progressing quickly and has already led to research contracts with dental companies.

JCDA: *How do you think the future of “knowledge translation” will unfold? How can we devise ways to better translate research findings and scientific articles into practical applications?*

Dr. Grenier: For a long time, knowledge translation for researchers was limited to publishing in the best peer-reviewed scientific journals or making presentations at scientific conferences. This notion has evolved and we now seek new ways to put the results obtained in laboratory research into practice, to facilitate commercialization of our discoveries or to modify current treatments in oral health. We must try to demonstrate that our laboratory work can lead to benefits for the population, which ultimately supports our work through taxes.

For my part, I try to share the results of my work not only at scientific conferences, but also with dentists — the primary users of our research outcomes — through continuing education courses. I also think it is important to report our research results in general articles for members of the profession and the public. For this reason, we should not neglect the importance of more far-reaching communication methods, like professional journals and general interest magazines. ✦

Ms. Natalie Ouellette is coordinator of French translation at the Canadian Dental Association.