Departmental Periodic Review
Summary
2000-2009

Department of
Microbiology and Immunology

Prepared by: Greg Matlashewski, Chair 2000-2009
Malcolm Baines, Chair 2009-present
Perspective from 2000-2009:

There were two major priorities on January 1st 2000, when the new Chairman, Dr. Greg Matlashewski joined the Department. First, it was essential to recruit new professors to sustain the research and teaching mission of the Department. With the major recruitment also came a major responsibility to providing appropriate infrastructure for the newly recruited members to compete and succeed in a highly competitive environment. Second, it was therefore essential to rebuild the research infrastructure of the department. These priorities represented the majority of the planning and development efforts of the Department for the years 2000-2005. During this period, there were 9 new faculty recruited, over 20 associate and adjunct members appointed and the infrastructure including laboratories and animal facilities were largely rebuilt as detailed in the review. From 2005 to the current time, the emphasis shifted to establishing competitive research programs, overhauling the undergraduate course and teaching lab material, and streamlining the graduate program. During this period, seven professors obtained promotion with tenure as evidence that they successfully established rigorous research programs and effective teaching material. As a result, the Department is much stronger now than in 2000 as a reflection of the newly recruited staff.

The next period from 2009 and beyond will be equally critical to the past 10 years and will require integration with the overall future direction of the Faculty of Medicine. The current interim and past Chair, Drs Baines and Matlashewski believe that the existing department structure is essential to maintain strength in research and teaching in Microbiology and Immunology. The disciplines of Microbiology and Immunology have merged closer together since 2000 with the rapid development of the area of innate immunity that largely integrates pathogens with the immune system. This area should represent the Department’s future focus and this should be taken under consideration when recruiting the next Department Chairman.

Strengths and Weaknesses of the Department as a whole

An important consideration during the rebuilding of the Department that began in 2000 was the diverse areas of expertise that were required to teach and train undergraduate and graduate students in Microbiology and Immunology, including bacteriology, virology, eukaryotic pathogens and Immunology. In 2000, there were only 9 full time academic staff members in the Department, several of which were no longer active in research. At that time, there was a serious risk that the Department could not continue to fulfill its mandate of teaching and research and would be shut down or merged. It was therefore essential to recruit and this was done without emphasis to one research area, but with the strict criterion for excellence in research. The Department now currently has 15 members including Gruenheid who relocated in 2008 from the Duff building to the Life Sciences building but is still a member of this department. In summary the Department recruited 9 new members (Cousineau, Fournier, Le Moual, Piccirillo, Gruenheid, Liu, Götte, Sheppard) starting with a new Chair (Matlashewski) in 2000. Three professors departed since 2000 including Dr. Ratcliff (Chair of Immunology at U. of Toronto), Dr. DuBow (Professor at the University of Paris), and Dr. Acheson, (retired). Dr. Eddy Chan, Professor Emeritus, who was active in teaching passed away during this period. Considering the recruited and departed professors, the Department is
overall in a much stronger position to pursue its mandate of excellence in teaching and research in Microbiology and Immunology.

Presently there are more people conducting research in Bacteriology than any other area with six laboratories actively training graduate students (Coulton, Cousineau, Gruenheid, Le Moual, Marczyński and Sheppard). However, it should be noted that the relocation of Professor Gruenheid to the Life Science Complex without consultation has weakened the bacterial research component of the Department. A priority area that needs strengthening however is in Immunology that currently has only two laboratories actively training graduate student (Piccirillo and Fournier). The field of immunology has rapidly advanced in recent years and the Department has not been able to maintain a major strength in this area, particularly with respect to innate immunity that is highly relevant to infectious diseases. The department is also relatively under represented in the area of Virology also with only three laboratories actively training graduate students (Liu, Götte and Matlashewski). Virology and drug development should therefore also be another discipline for expansion particularly given the strength of Dr. Götte in the area of antimicrobial agents.

**Future Recruitment Priorities**

Although the recruitment process has considerably strengthened the Department, there are still relatively few full time professors (15) when considering the large number of undergraduate (350) and graduate (75) students that are trained. In comparison, Departments with similar student numbers including Biochemistry, Physiology, and Pharmacology all have over 25 full time professors. Only the Department of Anatomy and Cell biology has fewer professors. Moreover, there are three professors in the Immunology area (Baines, Ali-Khan, and Murgita) who are eligible for retirement and it is essential that they be replaced with people to be located in the Duff Building. It will therefore be important to consider the Department of Microbiology and Immunology as a priority discipline when recruitment begins in the Faculty of Medicine, particularly in the area of innate and adaptive immune responses to infectious diseases and the development of antimicrobial agents. This will enable more collaborative efforts between Department microbiologists and immunologists. For example, in light of the problems associated with the treatment of infectious diseases worldwide, it is widely recognized that the development of preventative measures, including the development of microbicides and vaccines is as priority area. Finally, **it is essential** that no further professors be physically moved out of the Department into other facilities in McGill without the approval of the Chair. This has a negative effect on departmental moral and reduces the scientific interaction and productivity of the Department.
Teaching

Undergraduate Program:

The undergraduate program is the only basic science program in medicine that has an enrolment cap of 120 students. As a result, the students accepted in this program have on average higher grades than those accepted in the other basic science programs including biochemistry, physiology, pharmacology, and anatomy and cell biology. The department cannot accept more than 120 students because of the teaching lab space limitation for first year microbiology lab course (MIMM 212), second year laboratory (MIMM386D1/2) and the laboratory component of the final year Parasitology course (MIMM413). Many more students take our lecture courses as part of their science programs in Anatomy, Biochemistry, Biology, Physiology and other B.Sc. and B.A. & B.Sc. Programs. A major strength of the program is the depth in microbiology and immunology and opportunity for practical hands on learning. All of our courses are taught by tenured or tenure-stream Professors who are experts in their field and thus the material goes beyond textbooks and challenges students to think creatively. The program is further highlighted by the honors programs in Microbiology and Immunology where students spend over 18 hours per week during their final year doing laboratory research under the close supervision of a professor. The results are quite spectacular and often result in publications, awards and encourages students to continue into graduate studies within the department or at other universities. The success of this program was highlighted in McLean’s Magazine in 2003 (university ranking edition) where the department and its students were featured on the magazine cover.

Graduate Program:

There are currently over 75 graduate students registered in Microbiology and Immunology who are supervised by full time faculty members in the Duff building and associate members outside the Duff building. A 2007 external review of the basic sciences post-graduate program in Medicine concluded that McGill offered among the best graduate training in Canada that could compete effectively at the International level. More specifically regarding the Department of Microbiology and Immunology, it was recognized that there was a significant increase in the number of graduate students when comparing 2000 (60) to 2009 (75) and that the recruitment of 9 new professors has significantly increased the quality of the graduate program.

Research

Funding

In the year 2000, intramural Department members received approximately $1.7 million dollars of research funding from grants and contracts. Currently there is over 2.5 million dollars of research funding. It is important to note that in addition to national support, the Department also receives funding from a broad spectrum of international funding agencies including the NIH, WHO, DNDi, Gates Foundation and companies outside the country, which is indicative of the excellent international reputation of the Department.
**CFI Awards**

The above grant figures do not include the funding obtained from CFI since 2000. In this regard, the major success was the CFI award in 2001 to the Montreal Integrated Genomics Group for Research on Infectious Pathogens (MIGGRIP) application that was awarded $12 million dollars. This application was prepared by Greg Matlashewski together with Professor Roger Prichard from the Institute of Parasitology, McGill and Professor Irwin Schurr from the Host Resistance Group at the MUHC. The funds were equally distributed with over $4 million going to the Department of Microbiology and Immunology for infrastructure and laboratory renovations. This included a SPF animal facility to carryout infections with class 2 pathogens on the 7th floor of the Duff building.

Dr. Matlashewski was also one of the 10 Principal Investigators who helped to secure a more recent 2009 CFI award of $10.6 million entitled “The Disease to Therapy Initiative”. The Department of Microbiology and Immunology will receive about $0.5 million dollars principally to further upgrade the departmental cell sorting facility.

Eligible newly recruited members were also highly successful in obtaining New Opportunity CFI awards including Drs. Götte, Gruenheid, Liu, Sheppard, and Piccirillo.

**Salary Awards**

Every one of the 9 newly recruited individuals arriving since 2000 including the Chairman have received external salary awards from CIHR, FRSQ, or CRC

**Future Opportunities**

One major opportunity that the Department must take advantage of is the relocation of the Merck pharmaceutical infectious diseases research to Montreal (Point Claire facility) from West Point, PA beginning in 2009. This will provide an excellent opportunity for collaboration of our Professors with a major international pharmaceutical company. Dr. Matthias Götte is currently receiving funding from Merck for his research on novel HIV-1 polymerase inhibitors. Several members of the Department will be visiting the new Merck facility and presenting seminars and this will provide an opportunity to explore possible future interactions. We propose to have several senior scientists from Merck become appointed as Adjunct members to the Department of Microbiology and Immunology. Dr. Coulton has likewise initiated collaborative research with Boeringer Ingelheim. Dr. Piccirillo has also obtained contract funding from Glaxo Smith Klein for research on suppressor T-cells. Dr. Götte has additional contracts with Gilead Sciences and Tibotec, both international pharmaceutical companies. We expect these collaborations will continue to further develop into major research opportunities.

Dr. Greg Matlashewski has received funding from the Gates Foundation and Medicins Sans Frontiers (through the Drugs for Neglected Diseases Initiative, DNDi) in addition to his CIHR funding for his research on leishmaniasis. He will be taking a 2
year leave of absence (Sept. 2009-Sept. 2011) to work for the World Health Organization (WHO) in Geneva to lead a program to eliminate visceral leishmaniasis from the border regions of Northern India, Nepal and Bangladesh. During this period he will maintain a active research laboratory at McGill and continue to supervise his graduate students and postdoctoral research associates. Upon his return to McGill, he will continue this research program through the WHO and other funding partners. This will provide the Department of Microbiology and Immunology and McGill University with a new avenue of access for research and funding in global health, and neglected diseases of the developing world.
Departmental Periodic Review
2000-2009

Department of
Microbiology and Immunology

Chairman: Dr. Greg Matlashewski (2000-2009)
Dr. Malcolm Baines (2009-present)
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Department of Microbiology and Immunology: Periodic Review

I. Faculty

A. List of Faculty members with primary appointments in the Department

Dr. Greg Matlashewski (Chairman, 2000-2009)
Dr. Malcolm Baines (Interim Chairman, 2009-2010)
Dr. Zafer Ali-Khan
Dr. Dalius Briedis
Dr. James Coulton
Dr. Benoit Cousineau
Dr. Sylvie Fournier
Dr. Matthias Götte
Dr. Samantha Gruenheid
Dr. Herve Le Moual
Dr. Shan-Lu Liu
Dr. Greg Marczynski
Dr. Robert Murgita
Dr. Ciro Piccirillo
Dr. Donald Sheppard

A.1. Cross appointed Faculty

Dr. Albert Berghuis            Dr. John Hiscott      Dr. Mark Wainberg

B. List of Faculty with secondary appointments

Adjunct Professors:
Dr. Vibhuti Dave              Dr. George Kukolj   Dr. Clement Rioux
Dr. Albert Descoteaux         Dr. Peter Lau       Dr. Yoong-Kyung Suh
Dr. Elias Haddad              Dr. Andrew Makrigiannis
Dr. David Hugh Jones          Dr. Allan Matte

Associate Members:
Dr. Jack Antel                Dr. Arnold Kristof   Dr. Roger Palfree
Dr. Amit Bar-Or               Dr. Richard Lalonde  Dr. Kostas Pantopoulos
Dr. Marcel Behr               Dr. Byong Lee      Dr. Arnim Pause
Dr. Miguel Burnier            Dr. Chen Liang      Dr. Joyce Rauch
Dr. Shan Cen                  Dr. Vivian Loo      Dr. Michael Reed
Dr. Nicholas Christou         Dr. Amee Manges     Dr. Paula Ribeiro
Dr. Andre Dascal              Dr. Jack Mendelson  Dr. Stephane Richard
Dr. Anne Gatignol             Dr. Mark Miller     Dr. Maya Saleh
Dr. Sabah Hussain             Dr. Andrew Mouland  Dr. Christos Tsoukas
Dr. Armando Jardim            Dr. Jay Nadeau      Dr. Bernard Turcotte
Dr. Antonis Koromilas         Dr. Marianna Newkirk Dr. Silvia Vidal
Dr. Lawrence Kleiman          Dr. Martin Olivier  Dr. Brian Ward

C. Faculty recruited since 2000

Dr. Greg Matlashewski (Chairman, 2000-)
Dr. Benoit Cousineau           Dr. Herve Le Moual   Dr. Donald Sheppard
Dr. Sylvie Fournier            Dr. Shan-Lu Liu    Dr. Silvia Vidal
Dr. Matthias Götte            Dr. Martin Olivier
Dr. Samantha Gruenheid         Dr. Ciro Piccirillo

D. Faculty losses since the last review

Dr. Mike Ratcliff, Dr. Mike Dubow, Dr. Eddie Chan and Dr. Nick Acheson
E. Major Accomplishments of Primary Faculty

Dr. Greg Matlashewski (Chair), Treatment of *leishmaniasis* in Peru and India

In 2004, Greg Matlashewski obtained funding from Drugs for Neglected Diseases Initiative (part of Medicins Sans Frontiers, MSF) to carry out a human clinical trial for the treatment of cutaneous leishmaniasis in Peru. Only 4 projects were supported out of some 120 applications. This human trial was approved based on results coming from CIHR funded basic research showing that stimulation of Toll-Like Receptor 7 with imiquimod activates macrophage killing of intracellular *Leishmania* amastigotes. This human trial was conducted and followed up from 2004-2008. This trial involving 80 patients was effectively completed and resulted in identifying a better combination treatment for this disease. It also effectively enhanced the infrastructure for doing future research and clinical trials at Universidad Peruana Cayetano Heredia, Lima Peru. Based on the success of this trial, the World Health Organization has invited Dr. Matlashewski to lead a program to eliminate visceral leishmaniasis from the Bihar state in India using the skills he developed in Peru. He will take a 2 year leave of absence from McGill (Sept. 2009-Aug. 2011) and work for the WHO on this program and then continue this program from McGill upon his return.

Dr. Matlashewski has also sat on various advisory panels for: CIHR, NIH, UN, WHO, FDA, DNDi, and as a profession witness in the US court of Law (Washington) and the Canadian Parliamentary House of Commons. (See Appendix-1 for list of published work).

Dr. Malcolm Baines (Interim Chair)

During the chairmanship period of Professor Matlashewski, I have been primarily involved with the management of the Department of Microbiology and Immunology undergraduate academic program, the representation of our department and faculty on a number of university committees and in wrapping up my research program. Three activities could be considered major accomplishments. The first involves serving the faculty as a Senate Representative from 2000 - 2007, as a Senate representative to the Board of Governors and member of the BOG Executive committee from 2000-2001. The second consists of numerous activities on the McGill Association of University Teachers, twice serving as the President of MAUT, most recently in 2008-2009. Finally, having served on three university task forces addressing the issues related to the contractual employment of academic staff, the Principals task force in 2001-2004 and subsequently the Provosts task force from 2007-2008 that is now being translated into university policies and regulations by a joint University-MAUT Committee. These activities have already resulted in great improvements to the working conditions and security of employment of this vital sector of the university community of scholars and more are expected in the near future.

(See Appendix I for list of published work)

Dr. Zafer Ali-Khan

2. Obtained a U.S patent in collaboration with my graduate student- K.Alizadeh-Khiavi (#5-100-654 dated March 31, 1991) which is entitled "Diagnostic and pathogenic aspects of ubiquitin in amyloidosis"

(See Appendix I for list of published work)

Dr. James Coulton

James Coulton, Professor, internationally recognized for his research on molecular and structural biology of bacterial membrane proteins, has continuously held peer-reviewed research awards from MRC/CIHR and from NSERC for his 30-year career at McGill. He was co-PI for an infrastructure award from CFI call 3 (2002) and successful with multiple applications for operating and equipment grants (FRSQ, FQRNT, and
NSERC) plus two Strategic grants (NSERC) jointly with colleagues at the Faculté de médecine vétérinaire, Université de Montréal. Publications from the Coulton lab in the last decade (2000-present) have appeared prominently in Science, Nature Genetics, Journal of Biological Chemistry, Journal of Molecular Biology, BMC Genomics and Proteomics; multiple book chapters complement his primary publications. These achievements result directly from having mentored nine research associates and post-doctoral fellows, six doctoral graduates, eight master’s graduates, six honours undergraduates, and four research assistants/technicians. Two alumni from the Coulton lab are now Assistant Professors at Canadian universities. His group currently numbers 12 trainees. His students have represented their research at significant national and international conferences: International Union of Biochemistry and Molecular Biology, Montreal; Keystone Symposium, Taos; The Protein Society, Barcelona; Microbial Iron Transport, Paris; American Crystallographic Association, Hawaii.

In the past seven years, students from his team have five times won first prize for best presentation at the Graduate Student Symposium, Annual General Meeting of the Canadian Society of Microbiologists. Dr. Coulton is invited biennially to lecture at the Gordon Research Conference on Bacterial Cell Surfaces, a prestigious meeting that he has attended since mid-1970s. His teaching and mentoring commitments include two graduate courses, a long-standing contribution of many lectures to mid-level undergraduate science students, and coordinating Independent Studies in Microbiology and Immunology (MIMM 502), cornerstone of the department’s honours program. His dedication to honours students over the past 15 years that he coordinates this course has established him as the professor best recognized for his support of their continuing academic aspirations and professional opportunities.

(See Appendix I for list of published work)

**Dr. Benoit Cousineau**

We developed over the years various genetic assays that were instrumental in making significant contributions to the group II intron field.

- We determined the retrohoming pathway of the Ll.LtrB group II intron from *L. lactis*, the first retromobile element in procaryotes. We also revealed that the insertion of this intron to a specific site in double strand DNA by retrohoming uses an RNA intermediate in both *L. lactis* and *E. coli*.
- We demonstrated that group II introns, like retrotransposons, can also invade non-homologous sites using an RNA intermediate. We also showed that group II introns retrotranspose using pathways that are different than the previously described retrohoming pathway.
- We provided the first experimental proof of the long-standing and well-accepted theory that group II introns are laterally transferred between species. Our work shed light on why the great majority of bacterial group II introns are found associated with other mobile elements.
- We showed that bacterial group II introns can *trans*-splice *in vivo* when fragmented at various sites throughout its structure. Our findings support the theories proposing that group II introns are the progenitors of nuclear introns and that the five snRNAs of the spliceosome were derived from group II intron fragments.
- We unveiled that *L. lactis* exhibits proinflammatory effects which indicates a capacity for adjuvanticity and potential use as a bacterial live vaccine.

The impact of the science displayed in these papers (impact factor: Cell (29), Nature (28), Molecular Microbiology (6.4), Journal of Bacteriology (4.2), RNA (6.1), Nucleic Acids Research (7.6), vaccine (3.4)) is commented in journals of high importance and extensive readership: Nature, Current Biology, Nature Structural Biology.

(See Appendix I for list of published work)

**Dr. Matthias Gotte**

Research in Dr. Gotte’s laboratory is focused on the study of structure-function relationships of viral polymerases. Viral polymerases including the reverse transcriptase (RT) of the human immunodeficiency virus (HIV) and the RNA polymerase of the hepatitis C virus (HCV) are major targets in current drug discovery and development efforts. Although these enzymes have been extensively studied, the mechanism by which viral
polymerases translocate from one template position to the next has remained elusive. Dr. Gotte and his team
developed novel techniques to study translocation of HIV RT, and, most importantly, the results of these studies
validate RT translocation as a new target for the development of novel classes of RT inhibitors. They have
provided strong evidence to show that the RT enzyme can rapidly oscillate between pre- and post-translocated
states. Small molecules can specifically trap either one of the two complexes, which, in turn, blocks
incorporation of the next nucleotide substrate. These findings pave the way for completely new avenues in
discovery and development processes of novel antiviral compounds. His findings related to this topic resulted in
numerous publications, press releases, and research contracts with pharmaceutical companies worldwide
including Gilead Sciences Inc., Merck, and Tibotec.
(See Appendix-1 for list of published work).

Dr. Samantha Gruenheid

Research in Dr. Gruenheid’s lab is focused on understanding the molecular determinants that govern the
outcome of the host/pathogen interaction during infection with pathogenic E. coli strains such as EHEC (E. coli
O157:H7). The lab examines this interaction from both sides: the virulence mechanisms employed by bacteria
to cause disease, and the mechanisms employed by the host to fight infection. In 2004, Dr. Gruenheid identified
NleA, a bacterial protein that is critical for virulence of EHEC and related pathogens. In 2007 Dr. Gruenheid’s
team discovered that NleA inhibits protein secretion in host cells by specifically interacting with a host cell
protein, Sec24. In 2009, they discovered that this interaction leads to a breakdown of the barrier function within
the intestine of infected individuals. While pathogenic bacteria have evolved sophisticated virulence
mechanisms to cause disease within the host, the outcome of infection can vary greatly between individuals. Dr.
Gruenheid’s lab has recently indentified a genetic locus that controls mortality in an animal model of EHEC
infection, and is characterizing other loci that control bacterial replication in infected individuals. The long-term
goal of these studies is to broaden our understanding of the molecular processes that control host/pathogen
interactions and provide insight into the molecular basis of disease. Dr. Gruenheid is a Canada Research Chair,
and her research has been supported by two operating grants from the CIHR. In 2008, she was a finalist for the
Burroughs Welcome Fund Investigators in the Pathogenesis of Infectious Disease Award.
(See Appendix-1 for list of published work).

Dr. Shan-Lu Liu

Retroviruses play a fundamental role in our current understanding of cancer, AIDS, and some
neurological diseases. Over the last few years at McGill, I have been primarily interested in two related
oncogenic retroviruses, namely Jaagsiekte sheep retrovirus (JSRV) and enzootic nasal tumor virus (ENTV),
which cause lung and nasal tumors in sheep and goats, respectively. In addition to our renewed efforts to
better understand the mechanisms of oncogenic transformation by the envelope proteins of JSRV and
ENTV, we have shown for the first time that membrane fusion and cell entry mediated by these Env proteins
is pH-dependent, and exhibits some very interesting and unique features. For instance, we demonstrate that
the N-termini of the cytoplasmic tails of JSRV/ENTV Env, rather than those of C-termini, play an inhibitory
role in membrane fusion. Moreover, we find that both receptor and low pH are required for the activation of
fusion activity of JSRV and ENTV, which differs from that of most pH-dependent viruses. These
findings were published in some peer-reviewed international journals, such as Journal of Virology. As the
principle investigator, I have also been invited to give talks in international meetings, such as the Cold
Spring Harbor Retroviruses and International Conferences on Retroviral Pathogenesis, as well as some
leading universities in US, Canada and China.
(See Appendix-1 for list of published work).
Dr. Herve Le Moual

Our laboratory studies the *Salmonella enterica* PhoP/PhoQ two-component regulatory system for a decade. PhoP/PhoQ governs the timely expression of virulence factor genes that are essential for bacterial survival within macrophage phagosomes. Thus, novel antimicrobial drugs to defeat infection could therapeutically target PhoP/PhoQ. Since 1996, PhoP/PhoQ is known to respond to divalent cations present in the environment. We purified the PhoQ and PhoP proteins to homogeneity and reconstituted a functional PhoP/PhoQ system in liposomes, *in vitro* (*Biochemical Journal*, Vol. 390, p. 769-776, 2005). This reconstituted PhoP/PhoQ system represented a major advance in the field and was crucial to demonstrate that PhoQ senses host antimicrobial peptides, in addition to divalent cations. This major discovery showing that bacteria can arm themselves against host immune defenses by recognizing and responding to molecules of host origin led to a publication in the prestigious journal *Cell* (Vol. 122, p. 461-472, 2005). These experiments were conducted in collaboration with Dr. Samuel I. Miller (University of Washington Medical School, Seattle), a leader in the field of *Salmonella* pathogenesis. Pursuing this fruitful collaboration, we used the PhoP/PhoQ reconstituted system to show that PhoQ also responds to acidic pH (*Molecular Cell*, Vol. 26, p. 165-174, 2007). Acidic pH and antimicrobial peptides are likely the physiologically relevant cues recognized by *S. enterica* PhoQ during infection, since the vacuolar environment of macrophage phagosomes is characterized by the presence of antimicrobial peptides and a pH in the range of 5.0-6.5.

(See Appendix-1 for list of published work).

Dr. Robert Murgita

In terms of research, Dr. Murgita’s most significant accomplishment was the successful translation of almost twenty years of basic research on the biological functions of ALPHA-FETOPROTEIN from his laboratory to a commercial entity, whose goal it is to pursue clinical testing of Dr. Murgita’s inventions for immunotherapeutic use. After receiving approximately $3.5 million in competitive research grants up until 1997 in support of basic research on AFP, Dr. Murgita assigned his patented intellectual property to McGill, founded a biotech company in Cambridge, Massachusetts (originally called Atlantis Bio Pharmaceutical Inc. and now called Merrimack Pharmaceuticals), established a license agreement between McGill and Merrimack, and with the approval of McGill’s Board of Governors (see Appendix 1) initiated a long term Research Contract ($1,162,207.00) initial operating grant through 2004, renewable (see Appendix 2) and a $264,838.92 equipment grant (see Appendix 3). Thus far, Merrimack has completed three Phase II human clinical trials, testing the therapeutic value of Dr. Murgita’s inventions. The market cap of Merrimack is presently approximately $200 million. This value is based almost exclusively on Dr. Murgita’s patent portfolio of 29 national and international patents (see Appendix 4). In 2005, the license agreement with Merrimack was terminated and Dr. Murgita’s patent portfolio was assigned to the company. Presently, Dr. Murgita’s research is funded by a $160,000 transition grant, which is supporting new and novel research to develop small molecule immunotherapeutics. (See Appendix-1 for list of published work).

Dr. Martin Olivier

In the last 5-10 years, my laboratory has made important discoveries in the field of host-pathogen interaction, innate immune response and evasion mechanisms in relation to infectious diseases and in particular using the protozoan parasites responsible for leishmaniasis and malaria. Our findings that Leishmania parasite can trigger host protein tyrosine phosphatases (PTPs) to shut-down phagocytes signaling and innate immune functions led us to develop ways to control PTPs. On one hand, using PTP inhibitors in vivo we have been able to control the progression of leishmania in vivo favoring a Th1 type immune response, which findings was further used to demonstrate for the first time that by targeting PTPs activities pharmacologically it is possible to control ovarian and prostate cancers as well as to protect against allergic asthma. In regards to our malaria project targeting the metabolic waste of Plasmodium parasite, the hemozoin, we have been the first one to clearly demonstrate its role in the modulation of inflammatory disorder in vivo. We have further developed a
new way to generate synthetic hemozoin resembling exactly to the native one and that can be used as adjuvant in vaccination. This latter finding has been patented since. We more recently found that hemozoin pro-inflammatory action is in part induced via the NLRP3-inflammasome complex, as alum a very well known and worldwide used as adjuvant in human vaccine. Our findings, may permit the development of a new platform for the development of versatile adjuvant permitting long term vaccination. (See Appendix-1 for list of published work).

Dr. Ciro Piccirillo

Inspired from the seminal work from the laboratories of Shimon Sakaguchi, Ethan Shevach and Fiona Powrie, I then decided to pursue post-doctoral specialization in cellular immunology and immunosuppression. After obtaining my Ph.D. from McGill University in 1999, I was recruited as a post-doctoral fellow at the Laboratory of Immunology, National Institute of Allergies and Infectious Diseases (NIAID), National Institutes of Health (NIH). During my post-doctoral training, my research revolved around the immune regulation of autoimmune and infectious diseases mediated by naturally-occurring CD4\(^+\)Foxp3\(^+\) regulatory T (nTreg) cells, a unique population of CD4\(^+\) T lymphocyte with potent immunoregulatory functions found naturally in both man and mice. Throughout my post-doctoral training, I made use of various in vitro and in vivo models to characterize the mechanism of action of CD4\(^+\)Foxp3\(^+\) nTreg cells, and these studies have led to several, significant research contributions, many of which considered being seminal in nature. The study published in the Journal of Immunology in 2001 (cited over 400 times) was the first to assess the suppressive functions of CD4\(^+\) nTreg cells on cytolytic CD8\(^+\) T cells, and role of cognate cellular interactions operative in CD4\(^+\) Treg cell inhibitory effects. In another study published in the Journal of Experimental Medicine in 2002 (cited over 380 times). My work was also the first to examine the role of TGF-\(\beta\), a potent immunosuppressive cytokine, in CD4\(^+\)CD25\(^+\) T cell-mediated suppression, and showed that CD4\(^+\) Treg cells are functionally operative in the complete absence of TGF-\(\beta\) production or signaling in vitro. In another major collaborative study published in Immunity in 2002 (cited over 725 times), we described one of the first attempts at understanding the gene expression profile of CD4\(^+\) Treg cells by means of DNA microarray analysis, and found that Glucocorticoid-Induced TNF Receptor (GITR), a novel gene expressed by nTreg cells, plays a critical functional role in the induction of suppressor activity. Perhaps my most significant contribution is in a seminal study published in Nature in 2002 (cited over 700 times), in which we were the first to identify a role for CD4\(^+\) nTreg cells preferentially accumulate in chronically, infected sites, control parasite persistence primarily by suppressing anti-parasitic CD4\(^+\) T cell responses and also control concomitant immunity to microbial re-infections. This study illustrates the central role Treg cells have in the control of infectious disease and indicates potential novel immune evasion strategies employed by pathogens.

Collectively, the insights gained from these animal models have also shed some light in our understanding of human Treg cell function, and as such, has identified human Treg cells as a cellular target for various inflammatory conditions. Only six years later, there are now several international efforts to therapeutically restore or abrogate Treg cell function in the context of autoimmune and infectious diseases. Our basic research is timely and can have a clinical application in the near future. (See Appendix I for list of published work)

Dr. Silvia Vidal

Research in Dr Vidal’s laboratory exploits mouse models of infection to identify the genetic determinants of host susceptibility or resistance against infection with common, widespread viruses highly relevant to human health. The mouse chromosome 6 locus Cmv1 controls innate resistance against cytomegalovirus, a virus which may lead to severe or fatal disease in newborns and immunocompromised patients. Dr Vidal and her team showed that Cmv1 encodes a natural killer (NK) cell activating receptor,
Ly49H, which mediates recognition and clearance of cytomegalovirus infected cells. More recent work uncovered additional members of the Ly49 family in resistance to infection. These studies challenged the paradigm that NK cells can be activated non-specifically by showing that different NK cell activating receptors are exquisitely specific for viral determinants present on the surface of infected cell. The mouse chromosome 3 locus, Vms1, is a key determinant of host resistance against coxsackievirus type B3 (CVB3), an enterovirus associated with fulminant myocarditis and dilated cardiomyopathy. Vms1 controls several aspects of CVB3 pathology including virus load, cell infiltration of the myocardium and survival post-infection. The function of Vms1 is stimulated by type I interferon, indicating a link between interferon levels and CVB3-induced pathology, and demonstrating that Vms1 encodes and interferon-stimulated gene with antiviral activity. These findings have revealed host mechanisms that provide enhanced protection against viral infections, and grant new rationale to develop host-based therapeutic interventions. Dr Vidal findings related to these topics resulted in numerous publications, editorial comments and presentations in international conferences. (See Appendix-1 for list of published work).

F. Publications – see Appendix I

F.1 Patents and Reports of Inventions – see Appendix I.I

G. Method of orientation of new faculty members

With the influx of over 10 new faculty members since 2000, the orientation of these individuals upon arrival required considerable input from the Department Chair and the senior academic members of the Department including Drs Baines, Coulton, Acheson, and Ali-Khan. Initially the Chair met with the recruits to discuss and explain responsibilities and expectations. The Chair and senior academic staff further provided advice on development of teaching and course material, preparing grant applications, and providing feed-back on manuscript drafts. The mentors have also explained university policies and procedures where necessary and helped them through their probationary appointment period. In general, new professors start with a reduced teaching and administrative load while they establish their research programs. As their research develops they are added as members to committees to learn about administrative matters. Following reappointment for a second term of three years they are assigned coordination responsibilities for one course, and one or more committees to chair. The new recruits were provided with feedback and advice on research directions and priorities as required on an individual basis.

H. List of members of the faculty on committees

Dr. M. Baines:
Chairman Science Undergraduate Committee.
Chief Undergraduate Student Academic Advisor
Member Graduate Committee,
Member Fellowship Application Committee.
Member Departmental Animal Care Committee
Member Teaching and Research Equipment Committee.
Member of the Microbiology Promotions and Tenure Committee.
Faculty of Medicine BioScience Curriculum Committee.
Member of the Faculty of Medicine Graduate Program Study Group 4
Member Faculty of Science Academic Committee.
Science representative to the Senate of McGill University.
Member of the Buildings and Properties Committee.
Senate Representative to the McGill Board of Governors.
MAUT representative to the Principals Task Force on Non-Tenure Track Academic Staff of the Faculty of Medicine Graduate Program Study Group 4

Dr. J. Coulton:
Dr. Coulton served five years (2002-2006) as member and Chair of the major equipment committee, Alberta Heritage Foundation for Medical Research; and he continues with five years service as expert reviewer, Brookhaven National Laboratory, beamline X6A. Dr. Coulton was appointed (2006-present) Executive Member, Groupe d’étude des protéines membranaires, Université de Montréal; was elected (2006) Associate Research Microbiologist, Canadian College of Microbiologists; and since 1994 has held the esteemed distinction: Fellow of the American Academy of Microbiology.

Dr. B. Cousineau:
Chair of the equipment committee (2001-present)
Member of the graduate committee (2001-present)
Member of the undergraduate committee (2002-present)
Member of the chairmanship renewal committee (April 2005)
Member of the chairmanship committee (2009)
Member of the fellowships committee (2006-present)
Microbiology and Immunology academic advisor (2005-present)

Dr. S. Gruenheid:
Served on the Genetics Panel of the CIHR for the September 2008 Operating Grants competition and also on the panel for the Catalyst Grant competition on The Human Microbiome.

Dr. C. Piccirillo:
Co-Director of the Infection and Immunity Axis at MUHC since August 2008
Director of the Federation of clinical and immunology society since April 2009
Member of Research Council of MUHC-RI

Dr. S. Vidal:
MUHC-RI Fellowship/Scholarship Review Committee

I. Strengths and Weaknesses of the Faculty as a whole

An important consideration during the rebuilding of the Department that began in 2000 was the diverse areas of expertise that were required to teach and train graduate students in Microbiology and Immunology, including bacteriology, virology, eukaryotic pathogens and Immunology. In 2000, there were only 9 full time academic staff members in the Department, several of which were no longer active in research. At that time, there was a risk that the Department could not continue to fulfill its mandate of teaching and research and would be shut down or merged. The department relied heavily on associate members from other locations within the McGill campus and the MUHC but the daily activities associated with the management of the undergraduate students and the departmental programs were exclusively provided by the intramural faculty. It was therefore essential to recruit and this was done without emphasis to one research area, but with the strict criterion for excellence in research. The Department now currently has 15 members including one (Gruenheid who was relocated in 2008 from the Duff building to the Life Sciences Centre but is still a full member of this
department. In summary, the Department recruited 9 new members (Cousineau, Fournier, Le Moual, Piccirillo, Gruenheid, Liu, Gotte, Sheppard) starting with a new Chair (Matlashewski) in 2000. Three professors departed since 2000 including Dr. Ratcliff (Chair of Immunology at U. of Toronto), Dr. DuBow (Professor at the University of Paris), and Dr. Acheson, (retired). Dr. Eddy Chan, Professor Emeritus, who was active in teaching passed away during this period. Considering the recruited and departed professors, the Department is in overall stronger position to pursue its mandate of excellence in teaching and research in Microbiology and Immunology but is still under-strength in relation to the size of our programs.

With the major recruitment also came a major increase in overall research strength. Presently there are more people conducting active research in Bacteriology than any other area with six active laboratories (Coulton, Cousineau, Gruenheid, Le Moual, Marczynski and Sheppard). Professor Gruenheid is full member of the Department of Microbiology and Immunology and actively participates in our teaching program and has initiated a strong research program. However, it should be noted that Professor Gruenheid was physically relocated to the Bellini Life Science Complex without consultation and this has weakened the bacterial research component in the Department. A priority area that needs strengthening however is in immunology that currently has only two departmental professors actively training graduate students (Piccirillo and Fournier). The field of immunology has rapidly advanced in recent years and the Department has not been able to maintain a major strength in this area, particularly with respect to innate immunity that is highly relevant to infectious diseases. The department is also relatively under-represented in the area of Virology with only three professors training graduate students (Liu, Gotte, and Matlashewski). This should therefore be another discipline for expansion particularly given the strength of Dr. Gotte in the area of antimicrobial agents. This could open opportunities for collaboration with industry including Merck pharmaceuticals, which is expanding their facilities in Montreal.

J. Plan for Future Recruitment

Although the recruitment process has considerably strengthened the Department, there are still relatively few full time intramural professors (15) when considering the large number of undergraduate (350) and graduate (75) students that are being trained. In comparison, Departments with similar student numbers including Biochemistry, Physiology, and Pharmacology all have over 25 full time professors. Only the Department of Anatomy and Cell Biology has fewer professors. Moreover, there are three professors in the Immunology area (Baines, Ali-Khan, and Murgita) who are eligible for retirement and it is essential that they be replaced as soon as their positions become vacant. It will therefore be important to consider the Department of Microbiology and Immunology as a priority discipline when recruitment begins in the Faculty of Medicine, particularly in the area of innate and adaptive immune responses to infectious diseases and the development of antimicrobial agents. This will enable more collaborative efforts within the Department. For example, in light of the problems associated with the treatment of infectious diseases worldwide, it is widely recognized that the development of preventative measures, including the development of microbicides and vaccines is as priority area. Finally, it is essential that no further professors be physically moved out of the Department into other facilities in McGill without the approval of the Chair. This has a negative effect on departmental moral and reduces the scientific interaction and productivity of the Department.

K. Record of mentoring and promotions of Faculty since the last review

The senior members of the Department including the Chair (Dr Matlashewski) and Drs Baines, Coulton, Acheson, and Ali-Khan have all played important mentoring roles in advising new professors in developing their teaching, preparing grant applications, and providing feedback on manuscript drafts. The mentors have also explained university policies and procedures where necessary and helped them through their probationary appointment period. In general, new professors start with a reduced teaching and administrative load while they
establish their research programs. As their research develops they are added as members to committees to learn about administrative matters. Finally, following reappointment for a second term of three years they are assigned coordination responsibilities for one course, and one or more committees to chair. Although the mentoring was largely on an Ad Hoc basis, it has generally worked well. Since 2000, seven professors including; Marczynski, Olivier, Cousineau, Le Moual, Fournier, Gotte and Piccirillo (pending) have been promoted from assistant professor of associate professor with tenure. The remaining two assistant professors will be assessed for tenure in the near future (Sheppard (2009) and Liu (2010)). No assistant professor in Microbiology and Immunology has been denied tenure during this period. These professors have all been judged to be excellent in teaching, research and service to the community and have been successful in obtaining competitive salary awards, research grant funding and have published important research. This argues that the departmental mentoring over the past nine years was successful.
II. Department Administration and Governance

A. Administrative Table of Organization

- **Dr. Greg Matlashewski**  
  Chairman

- **Petra Gaiser**  
  Dept. Administrator  
  MR1898 - ADM2A

- **Mei Lee**  
  Secretary  
  CR1893 02 - PED 00033

- **Aghdas Zamani**  
  Chief Technician  
  TR1907 C3-PED 205

- **Jennifer DiMassimo**  
  Students Affairs Officer  
  MR1987 SAF 1D

- **Maria Panaritou**  
  Chief Technician - Adoption Leave

- **Lisa Bedard**  
  Administrative Coordinator  
  CR1895 C2 - PED 00034

- **Alicja Sobecka**  
  Student Affairs Coordinator  
  CR4383 01 PED 00046

- **Shan Hong Zhang**  
  Media Technician  
  TR1900 C1-00006

- **Tom Ringer**  
  Technical Assistant  
  RR1911 C1-PED00006

- **Casual**  
  Adoption Leave Replacement
B. Department Committees

Undergraduate Teaching Committee: Dr. Malcolm Baines (Chair);
Dr. Zafer Ali-Khan, Dr. Benoit Cousineau, Dr. Samantha Gruenheid,
Dr. Greg Marczyński, Dr. Matthias Götte, Dr. Robert Murgita,
Dr. Roger Palfree, Dr. Hervé Le Moual, Dr. Dal Briedis,
Dr. James Coulton, Dr. Joyce Rauch, Dr. Anne Gatignol, Jennifer DiMassimo

The mandate of this committee is to oversee the undergraduate courses and programs in Microbiology and Immunology. This involves the design and approval of new courses and programs in Microbiology and Immunology and the submission of proposal forms to the Faculties of Science and Medicine for approval. The undergraduate committee also oversees the departmental curriculum to ensure that it conforms to the standards for our discipline, evaluates the structure and delivery of our courses and recommends appropriate improvements. The undergraduate committee also receives information from the university, the Faculty of Science Academic Committee and the Faculty of Medicine Biomedical Curriculum Committee for communication to the departmental professors.

Fellowships Committee: Dr. Ali-Khan (Chair);
Dr. Malcolm Baines, Dr. Benoit Cousineau, Dr. Samantha Gruenheid,
Dr. Shan-Lu Liu, Dr. Ciro Piccirillo, Jennifer DiMassimo.

The mandate of this committee is to oversee the distribution of the fellowships awarded to graduate students of the Department of Microbiology and Immunology. While many students receive competitive external graduate studentships from the CIHR, NSERC and other foundations, the agencies usually require the Fellowships Committee to rank the candidates. The Fellowships Committee similarly ranks our applicants for several internal McGill awards. There are also two internal funds in the Department (F. C. Harrison and J. Rozanis) that provide small amounts of support for graduate students on the basis of academic merit and need. This fund is primarily used to offset the effects of the higher fees paid by out-of-province and international students.

Graduate Studies Committee: Dr. Ali-Khan (Chair);
Dr. Malcolm Baines, Dr. Benoit Cousineau, Dr. Sylvie Fournier, Dr. Matthias Götte,
Dr. Samantha Gruenheid, Dr. Silvia Vidal, Jennifer DiMassimo, Valerie LeSage.

The mandate of the Graduate Committee is to apply all the regulations and procedures specified by the Faculty of Graduate and Post-Doctoral Studies. This committee evaluates the dossiers of all applicants to graduate studies in Microbiology and Immunology and ensures that supervisors have provided the level of financial support to each student as required by their fee-status in the program. This committee also oversees the selection of graduate student advisory committees, comprehensive examinations, tracking of graduate student progress and recommendations for graduation. All graduate course teaching assignments are reviewed by this committee.

Equipment committee: Dr. Benoit Cousineau (Chair);
Dr. Malcolm Baines, Dr. James Coulton, Dr. Hervé Le Moual, Dr. Shan-Lu Liu,
Dr. Greg Marczyński, Dr. Martin Olivier

The mandate of this committee is the acquisition, maintenance and repair of all departmental research equipment. The costs of the activities of this committee are shared by all the research Professors in the Duff Building where the equipment is located.
Safety committee: Dr. Ali-Khan (Chair);
Tom Ringer, Aghdas Zamani, Joan Papillon (Nephrology),
Dr. Tomoko Takano (Nephrology)

The mandate of this committee to advise, apply and monitor compliance with the university safety regulations.

Animal care committee: Dr. Sylvie Fournier (Chair);
Jarrod Nichols, Lynn Matsumya, Holly Demare

The mandate of this committee is to represent the Principal Investigators, who use animals in their research, in the operation and space allocation in the Duff animal facility. This committee had a major role to play in the refitting and renovation of the old animal care facility to improve the quality of animal care and ensure compliance of the facility with the best level of animal care as set down by the Canadian Council for Animal Care.

FACS Cell sorting committee: Dr. Ciro Piccirillo (Chair);
Dr. Silvia Vidal, Dr. David Haegert, Dr. Greg Cosentino, Dr. Constantin Polychronakos,
Marie-Helene Lacombe (coordinator)

The mandate of this committee is to oversee the acquisition, operation, service and update of cell flow cytometric and sorting equipment in support of the research of the university community. The operational costs of this service are funded on a cost recovery basis and all users are charged an hourly fee for their use of this service.

Confocal microscopy committee: Dr. Samantha Gruenheid (Chair);
Dr. Ciro Piccirillo, Dr. Don Sheppard, Dr. Sylvie Fournier, Dr. Shan-Lu Liu,
Dr. Tomoko Takano, Patrick Logan

The mandate of this committee is to oversee the acquisition, operation, service and update of the confocal microscopy equipment in support of the research of the university community. The operational costs of this service are funded on a cost recovery basis and all users are charged an hourly fee for their use of this service.

Teaching Assistant committee: Dr. Malcolm Baines (Chair);
Dr. Greg Matlashewski, Dr. Zafar Ali-Khan, Dr. Shan-Lu Liu, Petra Gaiser

Teaching assistants are an essential part of the teaching team in any applied discipline. This committee informs the professors coordinating laboratory courses of the standardized AGSEM procedures regarding the recruitment, employment and workload of the teaching assistants. In consultation with the departmental Administrative Assistant who managed the budgetary issues, the workload and number of TAs recruited for laboratory and lecture courses is standardized and optimized.

Seminars committee: Dr. Shan-Lu Liu (Chair)

The mandate of the seminars committee is to invite speakers to present their research to the students and members of our department. Internationally recognized researchers in Microbiology and Immunology are invited to present their research to the McGill university community. In addition, all academic staff affiliated with the department are invited to present their research on a rotational basis to educate our graduate students to the greater scope of our research and create a collegial atmosphere that will foster collaborations with the university community.
C. Departmental meetings and departmental governance

There are monthly departmental meetings for the academic staff including representatives from the Graduate students and technical staff. Staff members are invited to include agenda items. These meetings have been an important forum to discuss and make decisions on recruitment priorities, departmental CFI applications, academic issues, and issues arising from the various specialized departmental committees.

The individual specialized departmental committees consist of several members and a chair and include undergraduate and graduate teaching committees, safety committee, equipment committees, animal care committee, fellowship committee. Each of these committees responds directly to the Chair of the Department and brings issues forward to the monthly staff meetings when necessary.

D. Departmental quality assurance and performance improvement committees: N/A

E. Departmental Strategic Plan and Perspective from 2000-2009:

There were two major priorities at the beginning of 2000. First, it was essential to recruit new professors to sustain the research and teaching mission of the Department. With the major recruitment also came a major responsibility to providing appropriate infrastructure for the newly recruited members to compete and succeed in a highly competitive environment. Second, it was therefore essential to rebuild the research infrastructure of the department. These priorities represented the majority of the planning and development efforts of the Department for the years 2000-2005. During this period, there were 9 new faculty recruited, over 20 associate and adjunct members appointed and the infrastructure including laboratories and animal facilities were largely rebuilt as detailed in the above sections. From 2005 to the current time, the emphasis shifted to establishing competitive research programs, overhauling the undergraduate course and teaching lab material, and streamlining the graduate program. During this period, seven professors obtained promotion with tenure as evidence that they were successful in establishing rigorous research programs and effective teaching material.

The next period from 2009 beyond will be equally critical to the past 10 years and will require integration with the future direction of the Faculty of Medicine. The current interim and past Chair, Drs Baines and Matlashewski believe that the existing department structure is essential to maintain strength in research and teaching in Microbiology and Immunology. The disciplines of Microbiology and Immunology have merged closer together since 2000 with the rapid development of the area of innate immunity that largely integrates pathogens with the immune system. This area should represent the Department’s future focus and should be taken under consideration when recruiting the next Department Chairman.
III. Education Program

A. Courses
See Appendix II

B. Role of individual faculty members in the education program.

<table>
<thead>
<tr>
<th>Professors of Microbiology and Immunology - Undergraduate teaching</th>
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<tbody>
<tr>
<td>Microbiology</td>
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<tr>
<td>James Coulton</td>
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<td>Benoit Cousineau</td>
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<td>Samantha Gruenheid**</td>
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<td>Hervé Le Moual</td>
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<td>Don Sheppard</td>
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<td>* Albert Berghuis</td>
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<th>Immunology</th>
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<tbody>
<tr>
<td>Sylvie Fournier</td>
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<td>Ciro Piccirillo</td>
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<td>* John Hiscott</td>
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<td>*** Roger Palfree</td>
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<th>Virology</th>
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<tr>
<td>Dalius J. Briedis</td>
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<td>Matthias Götte</td>
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<td>Mark Wainberg*</td>
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<td>Parasitology</td>
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</tr>
<tr>
<td>Zafer Ali-Khan</td>
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<td>Greg Matlashewski</td>
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<td>Martin Olivier</td>
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</table>

**C. Record of Evaluations**

See Appendix III

**D. Current positions of people trained in the department: N/A**

**E. Status of the accreditation of training program: N/A**

**F. Strengths**

**Undergraduate Program:**

The undergraduate program is the only basic science program in medicine that has had to install an enrolment cap of 120 students due to limitations in infrastructure for practical undergraduate training. As a result the students accepted in this program have on average higher grades than those accepted in the other basic science programs including biochemistry, physiology, pharmacology, and anatomy and cell biology. Specifically, the department cannot accept more than 120 students because of the teaching lab space limitation for first year microbiology lab course (MIMM 212), second year laboratory (MIMM386D1/2) and the laboratory component of our final year Parasitology course (MIMM413). Many more students take our lecture courses as part of their science programs in Anatomy, Biochemistry, Biology, Physiology and other B.Sc. and B.A. & B.Sc. Programs. A major strength of the program is the depth in microbiology and immunology and opportunity for practical hands on learning. All of our courses are taught by tenured or tenure-stream Professors who are experts in their field and thus the material goes beyond textbooks and challenges students to think creatively. The honors programs in Microbiology and Immunology where students normally spend over the required 18 hours per week during their final year doing laboratory research under the supervision of a professor further highlight the quality of the academic program. The research results are quite spectacular and often result in publications and awards and encourage students to continue into graduate studies within the Department or at other universities. The success of this program was highlighted in McLean’s Magazine in 2003 (university ranking edition) where the department and its students were also featured on the cover of the magazine.

**Graduate Program:**

There are currently over 75 graduate students registered in Microbiology and Immunology who are supervised by full time faculty members in the Duff building and associate members outside the Duff building. A 2007 external review of the basic sciences post-graduate program in Medicine concluded that McGill offered among the best graduate training in Canada that could compete effectively at the International level. More specifically regarding the Department of Microbiology and Immunology, it was recognized that there was a significant increase in the number of graduate students when comparing 2000 (60) to 2009 (75) and that the recruitment of 9 new professors has significantly increased the size and quality of the graduate program.
G. Weaknesses

Undergraduate:

A major deficiency in our program is that there is no course in microbiology and immunology given in the second term of the first year. Students take other core science courses and complementary courses at this time. It will be necessary to identify a new course to keep the students engaged in studying and thinking about microbiology and immunology throughout the 3-year program. For example, given the advances in innate immunology, it may be necessary to split the introductory immunology into 2 courses, covering innate immunity (200 level course) and the other covering cellular immunity (300 level course). A second weakness is that there is often insufficient time for interaction and discussion with the majority of our students outside of the honors program. There should be more opportunity for the students to learn from the professors outside of the classroom lectures. The creation of MIMM396, a single term research project in Microbiology and Immunology, has only partially addressed this deficiency.

H. Opportunities

There are several opportunities to increase the teaching effectiveness in the Department. The first objective is to develop a course to be taught in the second (winter) term of Year 1 to keep the undergraduate students engaged in microbiology and immunology throughout their academic program. Second, on a larger vision, the Department may consider a new more applied stream so that students opting for this would acquire the knowledge and qualifications to be employed in a hospital-based microbiology diagnostic laboratories. This would allow graduates from our program to be employed directly in microbiology labs since many do not go onto graduate studies or medicine.

I. Plans for Recruitment

All three professors (Ali-Khan, Baines, Murgita) who have reached the normal retirement age have a background in immunology. To maintain a strong teaching program in immunology in the Department and McGill, it must be a priority to recruit at least 3 professors with expertise in Immunology and locate them in the Duff Medical Science building to maintain the teaching and research in this subject at all levels and provide on-site advising to undergraduate students and training of graduate students of Microbiology and Immunology.

While there are currently four professors of virology (Briedis, Gotte, Liu and Matlashewski) this too must be considered as a sub-critical academic area. To maintain a critical mass of active research and teaching capacity in virology in the Duff building, the recruitment of at least 2 professors of virology is advisable.

If the Department were to develop a new stream in applied clinical microbiology then this will also require careful consideration for recruitment and the development of associations with the clinical diagnostic units and staff in the teaching hospitals.

In summary, the core cadre of academic personnel in the Department of Microbiology and Immunology and located in the Duff Medical Sciences building should be 18 professors, approximately equally distributed among the three core disciplines of Microbiology, Immunology and Virology.
IV Research Program

A. Description of research space and facilities.

Department of Microbiology and Immunology research space:

The professor’s research laboratories in the Duff Building are located on the 4th, 5th and 6th floors where there are also several departmental equipment rooms. The 7th floor houses the newly renovated animal facility that serves the department and the North-East sector of the University. A complete listing of Departmental space is included in Appendix IV.

The majority of the research labs were upgraded and renovated since the year 2000 using funds derived from CFI, FQRNT, and the Faculty of Medicine. It was essential that laboratory renovations were completed in order for the new faculty to promptly and successfully establish their research programs without delay.

All the below listed laboratories including the main lecture theatre, cafeteria, conference room and main building lobby entrance have been renovated since 2000:

7th Floor Animal Facility renovation:
Rooms 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714

Due to the renovation in 2004 this facility is now able to carry out infections with class 2 infectious agents and supports the research effort of the Department of Microbiology, Pathology, the Host Resistance Group, Nephrology and others. Supported by CFI funds awarded to Drs. G. Matlashewski, R. Pritchard and E. Schurr, a major reconstruction of the Duff Animal Care Facility was initiated to improve its security and Specific Pathogen Free status and to bring it into compliance with CCAC regulations. After setting up the complex control systems and solving some local problems, the facility was opened in 2005 and has performed as designed to the satisfaction of all the animal users in the Duff Medical building. This facility not only serves the Department of Microbiology and Immunology, but also the departments of Pathology, Nephrology and many others.

Renovations to laboratory space:

4th Floor laboratories last renovated:

403: Coulton Lab. Major renovations 2006
405: Coulton Lab. Major renovations 2006
406/408: Murgita Lab. Major renovations 2007
409: Piccirillo Lab. Minor improvements 2007

5th Floor laboratories last renovated:

D06: Gotte Lab. Major renovation in 2000
D21/26: Matlashewski Lab. Minor improvements 2005
D22/24: Gruenheid Lab. Minor improvements 2005
D27/29: Sheppard Lab. Minor improvements 2005

6th Floor laboratories last renovated:

600: Liu Lab (shared with Olivier) Major conversion from animal facility in 2003.
600: Olivier Lab (shared with Liu) Major conversion from animal facility in 2003.
617: Cousineau Lab. Major renovation of lab and office in 2002
Equipment rooms improved:
D5 (general equipment); D16 (cold room); D14 (autoclave room); D25 (confocal microscopy), D26 (tissue culture), D27 (tissue culture), D28 (general equipment), 405 (general equipment), 615 (cell sorting).

Other Areas Renovated:
Duff Building Foyer and Entrance (Using Funds from a Departmental Donor, Dr J. Rozanis).
Duff Cafeteria installed (New to the Building, at the request of the Chair).
Duff lecture Theatre.
Microbiology and Immunology Seminar room, 507/509.
Sheldon Conference room, D1.

Laboratories requiring renovation:
404/407: Baines Lab. Major renovations ~1985
500/503: Le Moual Lab. Major improvements ~1985
505/506: Marczynski Lab. Minor improvements ~2000
613: Vidal Lab. Minor improvements ~1990
616: Fournier Lab. Minor improvements ~1990

Weaknesses
The major weakness is a general loss of staff due to delays in hiring replacements that has lead to some weaker academic areas and this is particularly relevant for the areas of immunology and virology. While the department has been able to repopulate the area of bacteriology and microbial research, the department needs more professors of immunology and virology to optimize undergraduate teaching, research funding and graduate training. As a visible result, there are two vacant laboratories in the Microbiology and Immunology department.

Department of Microbiology and Immunology research and teaching facilities:

Animal research facility: The design of new facility was planned and the project managed with input from Professors Baines, Matlashewski, Piccirillo and the McGill Animal Resources Center to provide for future expansion to high-density racks for increased animal populations and to install the capability for room-specific air-flow control to permit animal experimentation using infectious agents. The safe handling of infected animals also required the installation of much needed equipment to sterilize all the animal care equipment and supplies and the wastes created by these projects.

Confocal microscopy: The acquisition of the Confocal Microscope with the aid of CFI funds has greatly aided the research of our PIs and the training of their students. A small research room was outfitted for the use of this instrument and a support staff member assigned to instruct users on it correct use.

Digital facilities for teaching and research presentation: The department pressed for the installation of digital video projectors and improved audio and video control systems in the lecture and seminar rooms. The department acquired PC and Apple laptop computers to assist the academic staff in the teaching of undergraduate and graduate courses. Graduate students are trained in the use of state of the art teaching tools and techniques for the presentation of their research progress.
Safety equipment for practical teaching of Microbiology: The practical teaching laboratories were equipped with laminar flow cabinets and improved equipment for sterility and safety in the handling of infectious microorganisms. Since the science of Microbiology is all about the growth, study and understanding of microbes, it is essential that the students can learn technical skills involved in cell and molecular biology and pathogenesis of microorganisms in a safe environment. Not only the research laboratories, but also the teaching laboratories have state of the art equipment to aid in their learning.

Renovations for teaching: The department pressed for the installation of digital video projectors and improved audio and video control systems in the lecture and seminar rooms. The department acquired PC and Apple laptop computers to assist the academic staff in the teaching of undergraduate and graduate courses. Graduate students are trained in the use of state of the art teaching tools and techniques. The practical teaching laboratories were equipped with laminar flow cabinets and improved equipment for sterility and safety in the handling of infectious microorganisms. Since the science of Microbiology is all about the growth, study and understanding of microbes, it is essential that the students can learn technical skills involved in cell and molecular biology and pathogenesis of microorganisms in a safe environment. Not only the research laboratories, but also the teaching laboratories have state of the art equipment to aid in their learning.

B. 1. List of Grants
In the year 2000, intramural Department members received approximately $1.7 million dollars of research funding from grants and contracts. Currently there is over 2.5 million dollars of research funding. A broad spectrum of international funding agencies including the NIH, WHO, DNDi, Gates Foundation and companies outside the country, which is indicative of the excellent international reputation of the Department. The specific breakdown by year is summarized in Appendix V.

B. 2. CFI Awards
The above grant figures do not include the funding obtained from CFI since 2000. In this regard, the major success was the CFI award in 2001 to the Montreal Integrated Genomics Group for Research on Infectious Pathogens (MIGGRIP) application that was awarded $12 million dollars. This application was prepared by Greg Matlashewski together with Professor Roger Prichard from the Institute of Parasitology, McGill and Professor Irwin Schurr from the Host Resistance Group at the MUHC. The funds were equally distributed with over $4 million going to the Department of Microbiology and Immunology for infrastructure and laboratory renovations. This included the creation of an SPF animal facility to support research on infections with class 2 pathogens on the 7th floor of the Duff building as previously described in section IV-A.

Dr. Matlashewski was also one of 10 Principal Investigators who helped to secure a more recent 2009 CFI award of $10.6 million entitled “The Disease to Therapy Initiative”. The Department of Microbiology and Immunology will receive about $0.5 million dollars principally to further upgrade the departmental cell sorting facility.

New Opportunity CFI awards were also awarded to the following members:
Dr. M. Götte: CFI New Opportunity Award, $300,000 (Co-applicant Dr. Cheng Liang)
Dr. S. Gruenheid: CFI New Opportunity Award, $455,370, 2005-2007
Dr. S. Liu: CFI Equipment Award, $802,635, 2005-2010
Dr. C. Piccirillo: CFI New Opportunity Award, $368,412, 2003-2004
Dr. D. Sheppard: CFI Equipment Award, $140,000, 2005-2007
Dr. S. Vidal: CFI Equipment Award, $385,000, 2004-2009
B. 3. Salary Awards

**Dr. Cousineau:**
CIHR New Investigator, 2000-2005
FRSQ New Investigator Award (2), 2005-2008
William Dawson Award (McGill), 2003-2008
William Dawson Award (McGill), 2008-2013
Hugh and Helen McPherson Memorial Award (McGill), 2008-2011

**Dr. S. Fournier:**
FRSQ New Investigator Award (2), 2004-2006
CIHR New Investigator Award, 1999-2004

**Dr. M. Gotte:**
FRSQ New Investigator Award, 2001-2004
CIHR New Investigator Award, 2004-2009

**Dr. S. Gruenheid:**
Canada Research Chair, 2005-2010.

**Dr. H. Le Moual:**
FRSQ, New Investigator Award (1), 1999-2001
FRSQ, New Investigator Award (2), 2001-2005

**Dr. S. Liu:**
Canada Research Chair, 2005-2010.

**Dr. G. Matlashewski:**
CIHR Senior Scientist Award, 2000-2005.

**Dr. M. Olivier:**
FRSQ Senior Investigator Award, 2002-2005

**Dr. C. Piccirillo:**
Canada Research Chair, 2004-2009, (renewed from 2009-2014)
FRSQ and CIHR New Investigator Award, awarded but declined.

**Dr. D. Sheppard:**
FRSQ, New Investigator Award, 2008-2012

**Dr. S. Vidal:**
Canada Research Chair, (2004-2011)
CIHR (previously MRC) Scholarship, (1997-2002)

C. Funding trends

Overall there has been a 40% increase in research funding since 2000. There has also been considerable variation over these years as the funding situation changes from year to year. For example, from 2000 there was a large contract from Martinex that ended in 2003. Since that time, the increase has been largely due to increased grant funding, as new individuals were successful in their applications. We expect that the current
funding situation will remain relatively stable. It is also evident that the Department is beginning to again obtain more contracts in recent years from Industry and we expect this to also grow in future. Note that this table does not include the CFI awards listed above in section B2. Taken together, the Department is quite healthy with respect to research funding.

D. Future Opportunities

One major opportunity that the Department must take advantage of is the relocation of the Merck pharmaceutical infectious diseases research to Montreal (Point Claire facility) from West Point, PA beginning in 2009. This will provide an excellent opportunity for collaboration of our Professors with a major international pharmaceutical company. Dr. Matthias Gotte is currently receiving funding from Merck for his research on novel HIV-1 polymerase inhibitors. Dr. Piccirillo has also obtained contract funding from Glaxo Smith Klein for research on vaccine development strategies. Several members of the Department will be visiting the new Merck facility and presenting seminars and this will provide an opportunity to explore possible future interactions. We propose to have several senior scientists from Merck become appointed as Adjunct members to the Department of Microbiology and Immunology. Dr. Coulton has likewise initiated collaborative research with Boeringer Ingelheim. Dr. Gotte has additional contracts with Gilead Sciences and Tibotec, both international pharmaceutical companies. We expect these collaborations will continue to further develop into major research opportunities.

Dr. Greg Matlashewski has received funding from the Gates Foundation and Medicins Sans Frontiers (through the Drugs for Neglected Diseases Initiative, DNDi) in addition to his CIHR funding for his research on leishmaniasis. He will be taking a 2 year leave of absence (Sept. 2009-Sept. 2011) to work for the World Health Organization (WHO) in Geneva to lead a program to eliminate visceral leishmaniasis from the border regions of Northern India, Nepal and Bangladesh. During this period he will maintain his active research laboratory at McGill and continue to supervise his graduate students and postdoctoral research associates. Upon his return to McGill, he will continue this research program through the WHO and other funding partners. This will provide
the Department of Microbiology and Immunology and McGill University with a new avenue of access for research and funding in global health, and neglected diseases of the developing world.

E. Strengths
A major strength is the revitalized research program in the Department. The developing interactions with the pharmaceutical industry and international organizations confirms that the impact of the research on practical applications to the prevention and treatment of infectious diseases and the use of immunology to detect and prevent disease through vaccine development.

F. Weaknesses
The major weakness is the failure to maintain a full complement of professors of microbiology and immunology and the freeze on hiring which is particularly relevant for the areas of immunology, virology and the development of antimicrobial agents and vaccines.

G. Opportunities
The imminent departure of some of our senior immunology staff members provides and opportunity and need for recruiting in strategic areas of cellular Immunology such as innate resistance, vaccine development, and immunotherapies for autoimmunity and infectious diseases. In addition, this is an opportune time to further develop the department’s strength in antimicrobial research, particularly with the Merck pharmaceutical group moving to Montreal. While the financial crisis and cuts to some research programs have caused some programs and positions to be terminated, this also creates opportunities to recruit outstanding senior researchers for the soon to be vacant Chair of the Department of Microbiology and Immunology.

H. Plans for Recruitment
The priority is to recruit a Chairperson to replace Dr. Matlashewski whose second 5-year term ends in 2009. He is also taking a 2-year leave of absence to work for the World Health Organization further depleting the Department in the short term. It is therefore important to recruit at least one well-established individual who could lead the department and strengthen the immunology, virology and antimicrobial programs in the Department. In addition, since there are 3 members who have reached retirement age, it is essential that further recruitment take place in the areas of immunology, virology, vaccine and drug development to replace these people in the next 2-3 years. This will be essential if the Department is to remain competitive internationally. As stated above, it is also essential that no further members of the Department be relocated outside of the Duff Medical building.
IV. FINANCES

A. Operating revenue and expense summary

Microbiology and Immunology
Operating Revenue and expense summary
For the period covering 2000-2009

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<th>Year</th>
<th>Budget</th>
<th>Expenses</th>
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<td>2009</td>
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<td>$1,850,446.14</td>
<td>$24,158.86</td>
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APPENDIX I – Publication of primary and secondary faculty

Publications – Primary Faculty

ALI-KHAN, Zafer


BAINES, Malcolm G.


Briedis, Dalius J.


Coulton, James W.


Cousineau, Benoit


GOTTE, Matthias

4.1. Refereed papers and review articles
*corresponding author, trainees are underlined


5. Ehteshami M, Götte M*. Effects of mutations in the connection and RNase H domains of HIV-1 reverse transcriptase on drug


17. Eggink D, Huigen MC, Boucher CA, Götte M, Nijhuis M
Insertions in the β3-β4 loop of Reverse Transcriptase of Human Immunodeficiency Virus Type 1 and their mechanism of action, influence on drug susceptibility and viral replication capacity
Antiviral Res. 2007 Aug;75(2):93-103. Review

18. Götte M*

Investigating the "Steric Gate" of Human Immunodeficiency Virus Type 1 (HIV-1) Reverse Transcriptase by Targeted Insertion of Unnatural Amino Acids. Biochemistry 2007, Feb 27;46(8):2118-2126


22. Götte M*, Wainberg MA


24. Tchesnokov EP, Gilbert C, Boivin G, Götte M*

25. Götte M*
Effects of Nucleotides and Nucleotide Analogue Inhibitors in a Ratchet Model of HIV-1 Reverse Transcriptase Translocation. Curr Pharm Des. 2006;12(15):1867-77; Review


27. Frankel FA, Marchand B, Turner D, M. Götte, Wainberg MA.

28. B. Marchand and M. Götte*.
29. Roldan A, Russell RS, Marchand B, M. Götte, Liang C, Wainberg MA


31. C.M. D'Abromo, L. Cellai and M. Götte*
Excision of incorporated nucleotide analogue chain-terminators can diminish their inhibitory effects on viral RNA-dependent RNA polymerases. J Mol Biol. 2004, 337:1-14

32. M. Götte*

33. Diallo K, M. Götte, Wainberg MA.


35. Diallo K, Marchand B, Wei X, Cellai L, M. Götte*, Wainberg MA*


38. Girouard M, Diallo K, Marchand B, McCormick S, M. Götte*


40. Wei X, Liang C, Götte M, Wainberg MA.
The M184V mutation in HIV-1 reverse transcriptase reduces the restoration of wild-type replication by


4.2. Books

4.3. Book Chapters
1. J. Deval and M. Götte
Nucleoside analogue inhibitors of HIV-1 RT. In ‘Antiviral Research’ Ed. Robert LaFemina, ASM Press, 2009


4.4. McGill Press Releases
1. Herpes drug inhibits HIV in patients infected with both viruses
September 15, 2008
http://www.mcgill.ca/newsroom/news/item/?item_id=101807

2. How 'hidden mutations' contribute to HIV drug resistance
McGill researchers explain how previously ignored parts of HIV genome play key role
July 31st, 2008
http://www.mcgill.ca/newsroom/news/item/?item_id=100943

3. Fighting drug resistance in hepatitis C virus
July 21st, 2007
http://www.mcgill.ca/newsroom/news/item/?item_id=26014

4. Research Paves Way Toward Less Toxic HIV Drugs
February 8, 2007
http://www.mcgill.ca/newsroom/news/item/?item_id=23779

GRUENHEID, Samantha
Gruenheid S, Finlay BB. Microbial pathogenesis and cytoskeletal function. Nature. 2003 Apr
17;422(6933):775-81. Review.
PMID: 12700772 [PubMed - indexed for MEDLINE]

Jabado N, Canonne-Hergaux F, Gruenheid S, Picard V, Gros P. Iron transporter Nramp2/DMT-1 is associated
with the membrane of phagosomes in macrophages and Sertoli cells. Blood. 2002 Oct 1;100(7):2617-22. PMID:
12239176 [PubMed - indexed for MEDLINE]
Zaharik ML, Gruenheid S, Perrin AJ, Finlay BB. Delivery of dangerous goods: type III secretion in enteric
MEDLINE]

PMID: 11533668 [PubMed - indexed for MEDLINE]

PMID: 11044672 [PubMed - indexed for MEDLINE]

Goosney DL, Gruenheid S, Finlay BB. Gut feelings: enteropathogenic E. coli (EPEC) interactions with the

Kwan T, Loughrey H, Brault M, Gruenheid S, Urbatsch IL, Senior AE, Gros P. Functional analysis of a
tryptophan-less P-glycoprotein: a tool for tryptophan insertion and fluorescence spectroscopy. Mol Pharmacol.

Gruenheid S, Gros P. Genetic susceptibility to intracellular infections: Nramp1, macrophage function and
divalent cations transport.

P, Pawson T, Ashman K, and Finlay BB. Identification and characterization of NleA, a non-LEE-encoded type
III translocated virulence factor of enterohaemorrhagic Escherichia coli O157:H7. Mol Microbiol 2004; 51:
1233-1249.


Submitted refereed papers


Manuscripts in preparation


Diez E, Zhu L, Roy MF, Loredo-Osti S, Malo D and Gruenheid S. Identification and characterization of Cri1, a locus controlling resistance to infection with Citrobacter rodentium. In preparation for submission to Genes and Immunity.

LE MOUAL, Hervé
In preparation:
Le Sage, V., Lepage, C., Portt, A., Daigle, F., Gruenheid, S., and Le Moual, H. An outer membrane protease of the omptin family prevents activation of the Citrobacter rodentium PhoPQ two-component system by antimicrobial peptides


Submitted:
Romeo, Y., Viau, C., Hancock, M. A., and Le Moual, H. Differential contribution of PhoP-box tandem motifs to transcriptional activation by the Salmonella enterica PhoP response regulator (submitted to Microbiology)

Published:


LIU, Shan-Lu


MARCZYNSKI, Greg
CtrA response regulator binding to the Caulobacter chromosome replication origin is required during nutrient and antibiotic stress as well as during cell cycle progression.

Comparative analysis of Caulobacter chromosome replication origins.
Shaheen SM, Ouimet MC, Marczynski GT. Microbiology. 2009 Apr;155(Pt 4):1215-1225.

Regulated degradation of chromosome replication proteins DnaA and CtrA in Caulobacter crescentus.


Conserved response regulator CtrA and IHF binding sites in the alpha-proteobacteria Caulobacter crescentus and Rickettsia prowazekii chromosomal replication origins.

Review


Transcription reporters that shuttle cloned DNA between high-copy Escherichia coli plasmids and low-copy broad-host-range plasmids. Ouimet MC, Marczynski GT. Plasmid. 2000 Sep;44(2):152-162.

Selective cell cycle transcription requires membrane synthesis in Caulobacter.

**MATLASHEWSKI, Greg**
Miranda-Verastegui, C., Tulliano, G., Gyorkos, T., Calderon, W., Rahme, E., Ward, B., Cruz, M., Llanos-Cuestas, A., and **Matlashewski, G.** First-line therapy for human cutaneous leishmaniasis involving the TLR 7 agonist imiquimod in combination with pentavalent antimony: Results from a randomized double-blind clinical trial in Peru. *Under revision for PLoS-NTD.*


Miranda-Verástegui, C., Arévalo, I., Llanos-Cuestas, A., Ward, B., and **Matlashewski, G.** Randomized, double...


OLIVIER, Martin


N. Genois, B. Barbeau, M. Olivier and M.J. Tremblay. Inhibition of HIV-1-mediated syncytium formation and virus replication by the lipophosphoglycan from *Leishmania donovani* is due to an effect on early events in the virus life cycle. *Clinical and Experimental Immunology* 124: 32-42 (2001).


C. Dumas, A. Muyombwe, G. Roy, C. Matte, M. Ouellette, M. Olivier* and B. Papadopoulou*. Recombinant Leishmania major expressing the granulocyte macrophage-colony stimulating factor gene is responsible for a
significant delay in cutaneous infection in mice. *Infection and Immunity* 71: 6499-6509 (2003). *Equal corresponding authors*


M. Jaramillo, P. Naccache and **M. Olivier.** Monosodium urate crystals synergism with IFN-gamma to generate macrophage nitric oxide: Involvement of ERK1/2 and NF-kappaB. *Journal of Immunology* 172: 5734-5742 (2004).


M. Jaramillo, M. Godbout and **M. Olivier.** Hemozoin induces macrophage chemokine expression through oxidative stress-dependent and -independent mechanisms. *Journal of Immunology* 174: 475-484 (2005).


D.J. Gregory and **M. Olivier.** Subversion of host cell signaling by the protozoan parasite *Leishmania. Parasitology* 130: S27-S35 (2005).


D.J. Gregory, M. Godbout, G. Forget, I. Contreras and M. Olivier. A Novel Form of NF-κB is Induced by Infection with the Intracellular Parasite Leishmania Concurring to Macrophage Chemokine Expression. (Paper Selected for EJI “In this Issue”) European Journal of Immunology 38: 1071-1081 (2008)


J. Blanchette, I. Abu-Dayyeh, K. Hassani, L. Withcombe and M. Olivier. Macrophage nitric oxide regulation by the phosphotyrosine phosphatase SHP-1. Immunology (Published ahead of printing September 2008)


**PICCIRILLO, Ciriacos A.**
Submitted & in preparation


Sgouroudis E., M. Kornete, and C.A. Piccirillo. ICOS signals promote CD4+Foxp3+ regulatory T cell function in islets and resistance to autoimmune diabetes. (Submitted 2009)


Published


**Solicited Reviews & Book Chapters**


Editorial


SHEPPARD, Donald


Sheppard DC, Doedt T, Chiang LY, Kim SH, Chen D, Nierman WC, Filler SG. The Aspergillus fumigatus StuA protein governs the upregulation of a discrete transcriptional program during the acquisition of developmental competence, Molecular Biology of the Cell. 2005 Dec;16(12):5866-79


**Submitted Manuscripts**

**Book Chapters**


**Invited Reviews**


Sheppard DC and Filler SG, Is There a Paradoxical Effect of Echinocandin Therapy in Invasive Aspergillosis? Current Fungal Infection Reports. 2007
VIDAL, Silvia


Publications – Secondary Faculty

BEHR, Marcel


Salamon H, Behr MA, Rhee JT, Small PM. Genetic distances for the study of infectious disease epidemiology. American Journal of Epidemiology, 2000 Feb 1;151(3):324-34


* Semret M, Bakker D, Smart N, Olsen I, Haslov K, Behr MA. Genetic analysis of M. avium complex strains used for producing Purified Protein Derivatives. Clinical and Vaccine Immunology 2006;13(9):991–996


* Said-Salim B, Mostowy S, Kristof AS, Behr MA. Mutations in Mycobacterium tuberculosis Rv0444c, the gene encoding anti-SigK, explain high level expression of MPB70 and MPB83 in Mycobacterium bovis. Molecular Microbiology, 2006 Dec;62(5):1251-63.


* Alexander DC, Behr MA. Rv1773 is a Transcriptional Repressor Deleted from BCG-Pasteur. Tuberculosis (Edinb). 2007 Sep;87(5):421-5


* Lowe AM, Yansouni CP, **Behr MA**. Causality and gastrointestinal infections: Koch, Hill and Crohn’s. Lancet Infectious Diseases, 2008, 8:720-726.


* Alexander DC, Turenne CY, **Behr MA**. Insertion and Deletion Events that Define the Pathogen *Mycobacterium avium paratuberculosis*. Journal of Bacteriology, 2009, 191(3): 1018–1025


* Coulombe F, Divangahi M, Veyrier F, Gleason JL, Yang Y, Kelliher MA, Pandey AK, Sassetti CM, Reed MB and **Behr MA**. Increased NOD2-Mediated Recognition of N-Glycolyl Muramyl Dipeptide. Journal of Experimental Medicine, in revision.
BERGHUIS, Albert

Publications in Refereed Journals

DeLaBarre, B., Thompson, P.R., Wright, G.D. & Berghuis, A.M. (2000). Crystal structures of Homoserine Dehydrogenase suggest a novel catalytic mechanism for oxidoreductases. *Nature Structural Biology* 7, 238-244. (times cited: 18)


Fong, D.H. & Berghuis, A.M. (2002) Substrate promiscuity of an aminoglycoside antibiotic resistance enzyme due to target mimicry. *EMBO J.* 21, 2323-2331. (times cited: 45; Faculty 1000; NPG focus on antibacterials library)


**Book Chapters**


**CEN, Shan**


---

**DASCAL, André**

**Peer Reviewed Journals**


Dial S, Kezouh A, Dascal A, Barkun A, Suissa S. Patterns of antibiotic use and risk of hospital admission because of Clostridium difficile infection among elderly people in Quebec. CMAJ. 2008 Oct 7;179(8):767-72.


Schneider-Lindner V, Delaney JA, Dial S, Dascal A, Suissa S. Antimicrobial drugs and community-acquired methicillin-resistant Staphylococcus aureus, United Kingdom. Emerg Infect Dis 2007 13(7); 994-1000


**Book Chapters**


**GATIGNOL, Anne**

**Peer-reviewed publications:**


Dorin, D., Bonnet M. C., Bannwarth, S., Gatignol, A., Meurs, E. F. and Vaquero, C. The TAR RNA binding protein, TRBP, stimulates the expression of TAR-containing RNAs in vitro and in vivo independently of its ability to inhibit the dsRNA dependent kinase PKR. 2003, J. Biol. Chem. 278: 4440-4448.


**Book chapters:**


**KRISTOF, Arnold**

**Peer Reviewed Publications**


Review Articles and Book Chapters:


LEE, Byong


**Books and Chapters**


Azarnia, S., LEE, B., Champagne, C., Robert, N. and V. Yalayan. 2007. Application of the encapsulated aminopeptidase of *Lactobacillus rhamnosus* to accelerate Cheddar cheese ripening. S1-4, XVth Intern. Workshop on Biocapsulation, Vienna, Austria, September 6-8.


LOO, Vivian


Hubert B, **Loo VG**, Bourgault AM, et al. A portrait of the geographic dissemination of the *Clostridium difficile* NAP1 strain and the epidemiology of *Clostridium difficile*-associated disease in Quebec. Clin Infect Dis. 2007; 44: 238-244.


MANGES, Amee


MOULAND, Andrew


CIHR Grant # HOP-56974, HOP-38111. A.J.M. wrote manuscript and in corresponding author.

CIHR Grant #MOP-38111


CIHR Grant # MOP-38111, # MOP-56974


Laurent Chatel-Chaix, Levon Abrahamyan, Andrew J. Mouland*, and Luc DesGroseillers*. 2007. The host protein Staufen1 participates in HIV-1 assembly in live cells by influencing pr55Gag multimerization. (last 2 authors are corresponding authors*). J. Virol. 81(12), 6216-6230. CIHR Grant # MOP-38111.

Jing Ma, Bibhuti Bushan Roy, Yongdong Zhou, Levon Abrahamyan, Qinghua Pan, Andrew J. Mouland and Chen Liang. 2008. Involvement of the DEAD-Box Protein DDX24 in the Packaging of Human Immunodeficiency Virus Type 1 RNA. Virology 375(1):253-64.
CIHR Grant # MOP-38111.

Lara Ajamian, Levon Abrahamyan, Miroslav Milev, Pavel V. Ivanov, Andreas E. Kulozik, Niels H. Gehring, and Andrew J. Mouland. 2008. UPF1 Unexpected roles for UPF1 in Human Immunodeficiency Virus type 1 RNA Metabolism and Translation. RNA J., 14 : 1-14. CIHR Grant # MOP-38111, MOP-56974, OPC-83178

Laurent Chatel-Chaix, Karine Boulay, Andrew J. Mouland and Luc DesGroseillers. 2008. Molecular determinants of Staufen1-mediated effects on human immunodeficiency virus type 1 assembly. Retrovirology 5:41. Contributions by AJM are seminal. AJM and LD are co-supervisors of LC-C. CIHR Grant # MOP-38111.


Martin Lehmann, Miroslav Milev, Levon Abrahamyan, X.-J. Yao, Nelly Pante and Andrew J. Mouland. 2009. Intracellular Transport of HIV-1 genomic RNA and Viral Production are Dependent on Dynein and Late Endosome Positioning. J. Biol. Chem, in press. CIHR Grant # MOP-38111, 56974

NEWKIRK, Marianna


Newkirk MM, Goldbach-Mansky R, Senior, B, Klippel J, Schumacher Jr HR and HS. El-Gabalawy. Elevated levels of IgM and IgA antibodies to Proteus mirabilis and IgM antibodies to Escherichia coli are associated with early rheumatoid factor (RF) positive rheumatoid arthritis. Rheumatology (Oxford). 2005 44(11):1433-41


**Patents**
US patent, #6100098. 2000. AGE-IgG and uses thereof for the diagnosis of sever disease. (Newkirk)
US patent #6,197,596. 2001. Monitoring and/or prognostic of antibody-mediated autoimmune diseases. (Newkirk)

**Reviews, book chapters**

**Others, including non-refereed publications**
Newkirk, MM. 2002 Editorial/Canadian Rheumatology Association Internet Journal Club

**PANTOPOULOS, Costas**
**Articles in peer-reviewed journals**


**Book chapters and contributions in edited books**


**RAUCH, Joyce**

**Peer Reviewed Publications**


**Chapters and Reviews**

**Non-Peer-Reviewed**


**Peer-Reviewed**


REED, Michael


Waller RF, Reed MB, Cowman AF, McFadden GI. Protein trafficking to the plastid of Plasmodium falciparum is via the secretory pathway. The EMBO Journal 2000; 19: 1794-1802.


Thompson JK, Triglia T, Reed MB, Cowman AF. A novel ligand from Plasmodium falciparum that binds to a sialic acid-containing receptor on the surface of human erythrocytes. Molecular Microbiology 2001; 41: 47-58.

Waller RF, Ralph SA, Reed MB, Su V, Douglas JD, Minnikin DE, Cowman AF, Besra GS, McFadden GI. A type II pathway for fatty acid biosynthesis presents drug targets in Plasmodium falciparum. Antimicrobial Agents and Chemotherapy 2002; 47: 297-301.


SALEH, Maya


**TSOUKAS, Christos**


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differentially to HIV peptide-specific responses within infected individuals: Correlation of these functional T cell subsets with markers of disease progression. Clinical Immunology 124,57-68, 2007.


Peretz Y, Tsoukas CTsoukas CM, Bernard NF. HIV Gag-specific immune responses predict the rate of CD4 decline. AIDS, 22(10)1222-4, 2008.

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TURCOTTE, Bernard


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BOOK CHAPTERS


WARD, Brian
Peer-Reviewed Manuscripts


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D’Souza Y, Fombonne E, Ward BJ. No evidence of persistent measles virus in peripheral blood mononuclear cells from subjects with autistic spectrum disorder. Pediatrics 2006; 118;1664-1675


Malaba LC, Iliff PJ, Nathoo KJ, Marinda E, Moulton LH, Zijenah LS, Zvandasara P, Ward BJ, the ZVITAMBO Study Group, and Humphrey JH: Impact of post-partum maternal or neonatal vitamin A


Ndao M, Bandyayera E, Kokoskin E, Gyorkos TW, MacLean JD, Ward BJ. Comparison of blood smear, antigen detection, and nested-PCR methods for screening refugees from regions where malaria is endemic after a malaria outbreak in Quebec, Canada. J Clin Microbiol. 2004;42:2694-700


Co-investigator –study design (10%), analysis (5%), writing (10%)


**Brief Reports/Case Reports**

Ward BJ, **Behr MA.** Courtrooms and Causality. (letter) Nature Clinical Practice 2008 (in press)


Marcus V, **Ward BJ,** Jutras P. Intestinal amebiasis: A diagnosis not to be missed. Pathology Research and Practice 197; 271-74: 2001

**Reviews, Book Chapters**


**Ward BJ.** Vaccines for travelling minors: the 'shot' heard around the world. Ped Child Health 2001; 6: 190-3

**Ward BJ.** Vaccine adverse events in the new millenium: is there reason for concern? Bull WHO 2000; 78: 112-123.
## APPENDIX I. I - Patents and Reports of Inventions

<table>
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<tr>
<th>Patent No.</th>
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APPENDIX II – List of Undergraduate and Graduate courses

**Undergraduate Courses:**

**MIMM 211 Introductory Microbiology.**
(3) (Fall) (3 hours of lecture) (Corequisite: BIOL 200) A general treatment of microbiology bearing specifically on the biological properties of microorganisms. Emphasis will be on procaryotic cells. Basic principles of immunology and microbial genetics are also introduced.

**MIMM 212 Laboratory in Microbiology.**
(2) (Fall) (3 hours laboratory, 0.5 hour lecture, 1 hour follow-up) (Corequisite: MIMM 211)
This laboratory course is designed to complement MIMM 211. Sessions introduce general techniques peculiar to the handling of microorganisms.

**MIMM 314 Immunology.**
(3) (Winter) (3 hours of lecture) (Prerequisite: BIOL 200 and BIOL 201 or BIOC 212)
An introduction to the immune system, antigens, antibodies and lymphocytes. The course will cover the cellular and molecular basis of lymphocyte development and mechanisms of lymphocyte activation in immune responses.

**MIMM 323 Microbial Physiology.**
(3) (Fall) (3 hours of lecture) (Prerequisite: MIMM 211) An introduction to the composition and structure of microbial cells, the biochemical activities associated with cellular metabolism and how these activities are regulated and coordinated. The course will have a molecular and genetic approach to the study of microbial physiology.

**MIMM 324 Fundamental Virology.**
(3) (Fall) (3 hours of lecture) (Prerequisites: MIMM 211, BIOL 200, BIOL 201 or BIOC 212) A study of the fundamental properties of viruses and their interactions with host cells. Bacteriophages, DNA- and RNA-containing animal viruses, and retroviruses are covered. Emphasis will be on phenomena occurring at the molecular level and on the regulated control of gene expression in virus-infected cells.

**MIMM 386D1 (3), MIMM 386D2 (3) Laboratory in Microbiology and Immunology.**
(Fall) (1 hour lecture, 4 hours laboratory, 1 hour follow-up) (Prerequisites: MIMM 211, MIMM 212. Corequisites: MIMM 314, MIMM 323, MIMM 324) (Students must register for both MIMM 386D1 and MIMM 386D2.) (No credit will be given for this course unless both MIMM 386D1 and MIMM 386D2 are successfully completed in both MIMM 386D1 and MIMM 386D2 are successfully completed in consecutive terms). This course presents the student with a series of illustrative exercises in bacterial classification, bacterial and viral genetics, molecular genetics and cell and molecular immunology. The objective is to provide a practical introduction to microbiological and immunological research and technology, including the creation of a research proposal and preparation of research reports.

**MIMM 387 Applied Microbiology and Immunology.**
(3) (Winter) (Prerequisite: MIMM 211) The ability to select and manipulate genetic material has lead to unprecedented interest in the industrial applications of procaryotic and eucaryotic cells. Beginning in the 1970s the introduction of and subsequent refinements to recombinant DNA technology and hybridoma
technology transformed the horizons of the biopharmaceutical world. This course will highlight the important
events that link basic research to clinical/commercial application of new drugs and chemicals.

**MIMM 396 Undergraduate Research Project.**
(3) (Restrictions: This course cannot be taken under the S/U option. Departmental permission required.
Students cannot be supervised by the same instructor for two 396 Science courses. Open to students in
programs offered by the Faculty of Science only.) (Note: Enrolment may be limited. Students are advised to
start the application process well before the start of the term and to plan for an alternative course in the case
that no suitable project is available. Individual projects will be suggested each term which may have project-specific prerequisites. Some projects may be accessible to students in other disciplines.
See http://www.mcgill.ca/science/ours for more information about available projects and application forms
and procedures.) Independent research project with a final written report.

**MIMM 413 Parasitology.**
(3) (Winter) (Prerequisite: MIMM 314 or equivalent – ANAT 261 is strongly recommended)
A study of the biology, immunological aspects of host-parasite interactions, pathogenicity, epidemiology and
molecular biological aspects of selected parasites of medical importance. Laboratory will consist of a lecture
on techniques, demonstrations and practical work.

**MIMM 414 Advanced Immunology.**
(3) (Fall) (3 hour lecture) (Prerequisite: MIMM 314) an advanced course serving as a logical extension of MIMM 314. The course will integrate molecular, cellular
and biochemical events involved in the ontogeny of the lymphoid system and its activation in the immune
response. The course will provide the student with an up-to-date understanding of a rapidly moving field.

**MIMM 465 Bacterial Pathogenesis.**
(3) (Fall) (3 hours of lecture) (Prerequisites: MIMM 211, MIMM 314, MIMM 323, or the permission of the
instructor) Organized by the McGill Centre for the Study of Host Resistance. This course focuses on the
interplay of the host and the pathogen. The cellular and molecular basis of the host defense mechanism
against infections will be considered in relationship to the virulence factors and evasion strategies used by
bacteria to cause disease.

**MIMM 466 Viral Pathogenesis.**
(3) (Winter) (3 hours of lecture) (Prerequisites: MIMM 211, MIMM 324, MIMM 314) A study of the
biological and molecular aspects of viral pathogenesis with emphasis on the human pathogenic viruses
including the retroviruses HIV and HTLV-1; herpes viruses; papilloma viruses; hepatitis viruses; and new
emerging human viral diseases. These viruses will be discussed in terms of virus multiplication, gene
expression virus-induced cytopathic effects and host immune response to infection.

**MIMM 486D1 Laboratory Methods. (2003-204)**
(Students must also register for MIMM 486D2) (No credit will be given for this course unless both
MIMM 486D1 and MIMM 486D2 are successfully completed in consecutive terms).

**MIMM 486D2 Laboratory Methods. (2003-204)**
(Prerequisite: MIMM 486D1) (No credit will be given for this course unless both MIMM 486D1 and
MIMM 486D2 are successfully completed in consecutive terms). See MIMM 486D1 for course description.
MIMM 499 Library Research Project.
(1) (Prerequisites: MIMM 314, MIMM 323, MIMM 324 and MIMM 386.) (Restriction: This course is intended for final year Microbiology students only. Students taking MIMM 502 are not eligible to take this course. (See section 3.6.2, "Project Courses" in the Science "Faculty Degree Requirements").) Supervised exploration of the current scientific literature on an assigned topic of an advanced nature within the general areas of Bacteriology, Virology, Immunology or Parasitology.

MIMM 502D1 (6), MIMM 502D2 (6) Honours Research Project.
(Fall) (More than 18 hours per week for an independent research project) (Restriction: U3 Honours students and Majors students are eligible. Required CGPA: 3.50 or higher) (Please see regulations concerning Project Courses) (Students must register for both MIMM 502D1 and MIMM 502D2.) (No credit will be given for this course unless both MIMM 502D1 and MIMM 502D2 are successfully completed in consecutive terms) An information meeting about the course is held annually in January for students who intend to apply for registration. Subject to the availability of space and resources, professors in the Department of Microbiology and Immunology provide research opportunities for registrants in this course. Students present their research findings in a seminar and a final written report is required. Because this is a 12 credit course, students are expected to devote at least 40% of their academic effort towards their research.

MIMM 509 Inflammatory Processes.
(3) (Winter) (3 hours of seminar) (Prerequisite: MIMM 314.) (Corequisite: PHGY 513 or MIMM 414) (This course will be given in conjunction with the Division of Experimental Medicine) This course concentrates on the non-specific aspects of the immune response, an area which is not adequately covered by the other immunology courses presented at the university. Interactions between guest researchers (from McGill and other universities) and students will be furthered.

Graduate Courses:
MIMM 611 Graduate Seminars 1. (3)

MIMM 612 Graduate Seminars 2. (3) (Restriction: M.Sc. students - presentation of two seminar topics throughout the course of their degree program)
MIMM 613 Current Topics 1. (3)

MIMM 614 Current Topics 2. (3)

MIMM 615 Current Topics 3. (3) M.Sc. Students (discussion groups with guest speakers).
MIMM 616 Reading and Conference 1. (3) (Restriction: M.Sc. students - two of these courses required throughout the course of their degree program) Student presentations, taken from current literature, are concerned with aspects of a central topic. Presentations are designed to be informal and to generate student discussions. Topic will change from term to term.
MIMM 617 Reading and Conference 2.
(3) (Restriction: M.Sc. students - two of these courses required throughout the course of their degree program) Student presentations, taken from current literature, are concerned with aspects of a central topic. Presentations are designed to be informal and to generate student discussions. Topic will change from term to term.

MIMM 618 Reading and Conference 3.
(3) (Restriction: M.Sc. students - two of these courses required throughout the course of their degree program) Student presentations, taken from current literature, are concerned with aspects of a central topic. Presentations are designed to be informal and to generate student discussions. Topic will change from term to term.

MIMM 619 Reading and Conference 4.
(3) (Restriction: M.Sc. students - two of these courses required throughout the course of their degree program) Student presentations, taken from current literature, are concerned with aspects of a central topic. Presentations are designed to be informal and to generate student discussions. Topic will change from term to term.

MIMM 697 Master's Research 1.
(8) (Restriction: M.Sc. students) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

MIMM 698 Master's Research 2.
(8) (Restriction: M.Sc. students) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

MIMM 699 Master's Research 3.
(8) (Restriction: M.Sc. students) Independent work under the direction of a supervisor on a research problem in the student's designated area of research.

MIMM 701 Comprehensive Examination-Ph.D. Candidate. (0)

MIMM 701D1 (0), MIMM 701D2 (0) Comprehensive Examination-Ph.D. Candidate.
(Students must also register for MIMM 701D2) (No credit will be given for this course unless both MIMM 701D1 and MIMM 701D2 are successfully completed in consecutive terms) (MIMM 701D1 and MIMM 701D2 together are equivalent to MIMM 701)

MIMM 713 Graduate Seminars 3. (3) (Restriction: Ph.D. students) Presentation of a maximum of three seminars topics throughout the course of their degree program.
(1) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

MIMM 721D1 (0.5), MIMM 721D2 (0.5) Ph.D. Research Progress Report 1.
(Students must also register for MIMM 721D2) (No credit will be given for this course unless both MIMM 721D1 and MIMM 721D2 are successfully completed in consecutive terms) (MIMM 721D1 and MIMM 721D2 together are equivalent to MIMM 721) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

(1) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

MIMM 722D1 (0.5), MIMM 722D2 (0.5) Ph.D. Research Progress Report 2.
(Students must also register for MIMM 722D2) (No credit will be given for this course unless both MIMM 722D1 and MIMM 722D2 are successfully completed in consecutive terms) (MIMM 722D1 and MIMM 722D2 together are equivalent to MIMM 722) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

MIMM 723 Ph.D. Research Progress Report 3.
(1) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

MIMM 723D1 (0.5), MIMM 723D2 (0.5) Ph.D. Research Progress Report 3.
(Students must also register for MIMM 723D2) (No credit will be given for this course unless both MIMM 723D1 and MIMM 723D2 are successfully completed in consecutive terms) (MIMM 723D1 and MIMM 723D2 together are equivalent to MIMM 723) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.
MIMM 724D1 (0.5), MIMM 724D2 (0.5) Ph.D. Research Progress Report 4. (Students must also register for MIMM 724D2) (No credit will be given for this course unless both MIMM 724D1 and MIMM 724D2 are successfully completed in consecutive terms) (MIMM 724D1 and MIMM 724D2 together are equivalent to MIMM 724) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research plans. Committee gives advice on progress and fine-tuning the research project.

MIMM 724 Ph.D. Research Progress Report 4. (1) Each Ph.D. student has an advisory committee (3 professors including research advisor) that meets yearly to consider student's progress. Students submit a 6-page progress report to the committee and give a 20-minute oral presentation, discussing data obtained and future research
**APPENDIX II – Student evaluation of Faculty**

**Student Course Evaluation 2000 – 2001**

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APENDIX IV – Research Facilities

Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
4th floor
Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
6th floor
# APPENDIX V – List of Grants

## Research Grants for 2000-2001

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Sapientia Therapeutics Ltd
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World Health Organization

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Total for 2003-04: $1,215,635.00
## Research Grants for 2004-2005

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<td>206656</td>
<td>CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes</td>
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<td>$ 118,110.00</td>
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Leishmania Infections

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**Natural Sciences and Engineering Research Council of Canada**

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**Universite de Montreal**

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**Valorisation Recherche Quebec**

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**Total for 2004-05:** $1,208,748.20
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Page 134 of 144
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**Total for 2005-06:** $ 1,956,183.60
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<td>Ciriaco Piccirillo</td>
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Pathogenic mechanisms in an animal model of CD8+ T cell-mediated demyelinating disease

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Tibotec Pharmaceuticals Limited

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University of Virginia

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**University of Virginia**

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<td>Developmentally dependent virulence mechanisms of the invasive mold aspergillus fumigatus</td>
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<td>Sheldon Biotechnology Centre: Surface Plasmon Resonance Facility</td>
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<td>213232</td>
<td>Molecular mechanisms involved in HIV drug resistance to different classes of RT inhibitors</td>
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<td>CIHR/endMS Team in Immune Regulation and Biomarker Development for Pediatric and Adult Autoimmune Diseases</td>
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<td>Immunomodulation of regulatory mechanisms in mucosal immunity: A multi disciplinary bench to bedside approach to the study and treatment</td>
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<td>$ 159,705.48</td>
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<td>Development of a new generation of live vaccines using Lactococcus lactis</td>
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<td>Genetic dissection of the host response to intestinal infections</td>
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<td>221530</td>
<td>Developmental And Cell-Cycle Control Of Chromosome Replication</td>
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<td>224766</td>
<td>Structural Biology Of Bacterial Membrane Proteins</td>
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<td>213357</td>
<td>Functional impact of CD4+FOXP3+regulatory T cells in autoimmune diabetes</td>
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<td>213524</td>
<td>What are the problems in the development of HIV Rnase H inhibitors?</td>
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<td>Interaction between the polymerase of the hepatitis C virus and different classes of inhibitors</td>
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<td>211055</td>
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<td>214186</td>
<td>Transcriptional Regulation of A Fumigatus Virulence</td>
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<td>210057</td>
<td>Development of New Models of Invasive Aspergillos</td>
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<td>216361</td>
<td>Understanding &amp; Exploiting the Mechanism of Raltegravir</td>
<td>21-Aug-2008</td>
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<td>210882</td>
<td>Pathogenic mechanisms in an animal model of CD8+T cell-mediated demyelinating disease</td>
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<td>212895</td>
<td>Excision of Nucleoside analysis by the Hepatitis C RNA dependent</td>
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### Natural Sciences and Engineering Research Council of Canada

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<td>Signal Transduction By Bacterial Ser/Thr Kinases</td>
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<td>206249</td>
<td>Site-Specific Footprinting Of Protein-Nucleic Acid Complexes</td>
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<td>Biochemical Characterization of a Novel Class of Antiviral Compounds with Activity Against HCV NS5B Polymerase and/or HIV RT</td>
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### University of Virginia

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### Gates Foundation

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<td>217873</td>
<td>Development of molecular diagnostics for visceral leishmaniasis</td>
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Total for 2008-09: $2,553,577.29