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, Marczynski 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 results 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 a 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. Matthias Götte	Dr. Greg Marczynski
Dr. Dalius Briedis	Dr. Samantha Gruenheid	Dr. Robert Murgita
Dr. James Coulton	Dr. Herve Le Moual	Dr. Ciro Piccirillo
Dr. Benoit Cousineau	Dr. Shan-Lu Liu	Dr. Donald Sheppard
Dr. Sylvie Fournier		

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

1. Appointed associate editor: Journal of Alzheimer Disease 2001-2003
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 prokaryotes. 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 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 $CD4^+Foxp3^+$ nT_{reg} 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 $CD4^+$ nT_{reg} cells on cytolytic $CD8^+$ T cells, and role of cognate cellular interactions operative in $CD4^+$ T_{reg} 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-β1, a potent immunosuppressive cytokine, in $CD4^+CD25^+$ T cell-mediated suppression, and showed that $CD4^+$ T_{reg} cells are functionally operative in the complete absence of TGF-β1 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 $CD4^+$ T_{reg} cells by means of DNA microarray analysis, and found that Glucocorticoid-Induced TNF Receptor (GITR), a novel gene expressed by nT_{reg} 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 $CD4^+$ nT_{reg} 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 T_{reg} 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 T_{reg} cell function, and as such, has identified human T_{reg} cells as a cellular target for various inflammatory conditions. Only six years later, there are now several international efforts to therapeutically restore or abrogate T_{reg} 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)
Committees for NSERC equipment grant submissions (2001, 2002, 2004, 2007, 2008)
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 underrepresented 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.

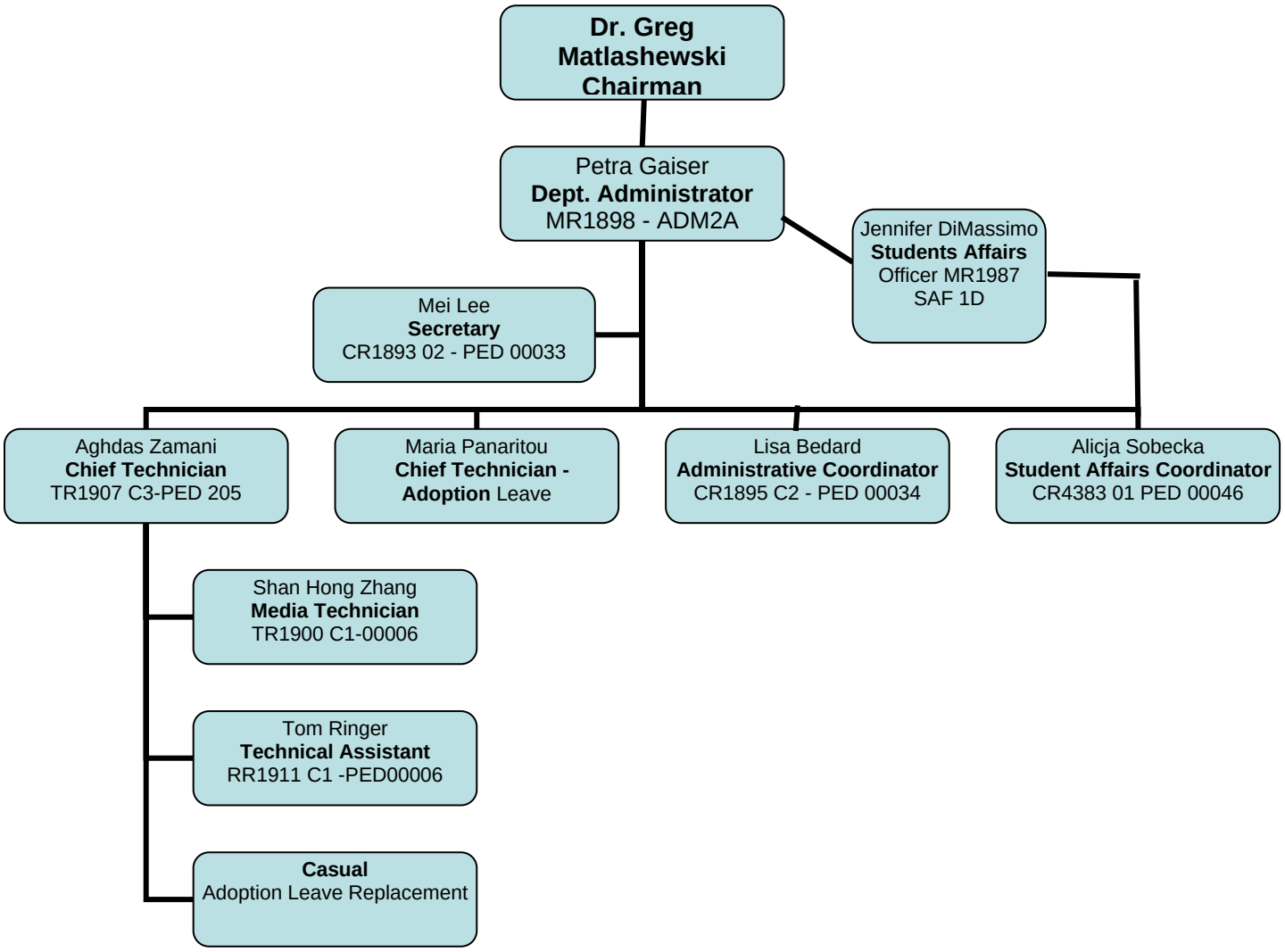
K. Record of mentoring and promotions of Faculty since the last review

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 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. 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



B. Department Committees

Undergraduate Teaching Committee: Dr. Malcolm Baines (Chair);
Dr. Zafer Ali-Khan, Dr. Benoit Cousineau, Dr. Samantha Gruenheid,
Dr. Greg Marczynski, 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 Marczynski, 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.

Professors of Microbiology and Immunology - Undergraduate teaching			
Microbiology	**Research focus**	**Coordination:**	**Teaching-Undergraduate:**
James Coulton	Microbial transport systems	MIMM502	MIMM323, -386, -465, -502.
Benoit Cousineau	Microbial genetics and vaccines	MIMM211	MIMM211, -323, -386, -465, -502.
Samantha Gruenheid**	Microbial pathogenesis.	MIMM212	MIMM211, -212, -323, -386, -502.
Hervé Le Moual	Microbial regulatory systems.	MIMM465	MIMM465, -386, -502.
Gregory Marczynski	Microbial gene expression and control.	MIMM323	MIMM323, -386, -465, -502.
Don Sheppard	Mycological pathogenesis.		MIMM211, -212, -386, -502
* Albert Berghuis	Anti-microbial drug design.		MIMM386.
Immunology			
Malcolm Baines	Immunology of early embryo loss.	MIMM386, MIMM396, MIMM499	MIMM211, -314, -386, -414, -466, -502.
Sylvie Fournier	Activation of the immune response.	MIMM414	MIMM314, -386, -414, -502.
Robert Murgita	Immunoregulatory proteins and peptides.	MIMM387	MIMM387, -386, -502.
Ciro Piccirillo	Immunoregulatory cells and factors.		MIMM314, -386, -414, -502.
* John Hiscott	Viral pathogenesis and immunity		MIMM324, -386, -502.
*** Roger Palfree	Cellular receptors and activation.	MIMM314	MIMM314, -386, -502.
Virology			
Dalius J. Briedis	Myxovirus pathogenesis.	MIMM466	MIMM324, -386, -466.
Matthias Götte	Hepatitis virus pathogenesis.	MIMM324	MIMM324, -386, -466, -502.
Shan-Lu Liu	Oncoviral pathogenesis.		MIMM324, -386, -502.
Mark Wainberg*	Retroviral pathogenesis.		MIMM466, -386, -502.

Parasitology			
Zafer Ali-Khan	Parasitic immunopathogenesis.	MIMM413	MIMM413, -386.
Greg Matlashewski	Parasitic immunopathogenesis Virology and oncogenesis.		MIMM211, -324, -386, -413, -502
Martin Olivier	Parasitic immunopathogenesis.		MIMM211, -386, -413, -502,

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
508: Ali-Khan Lab.	Minor improvements ~1985
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.
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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 a 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.

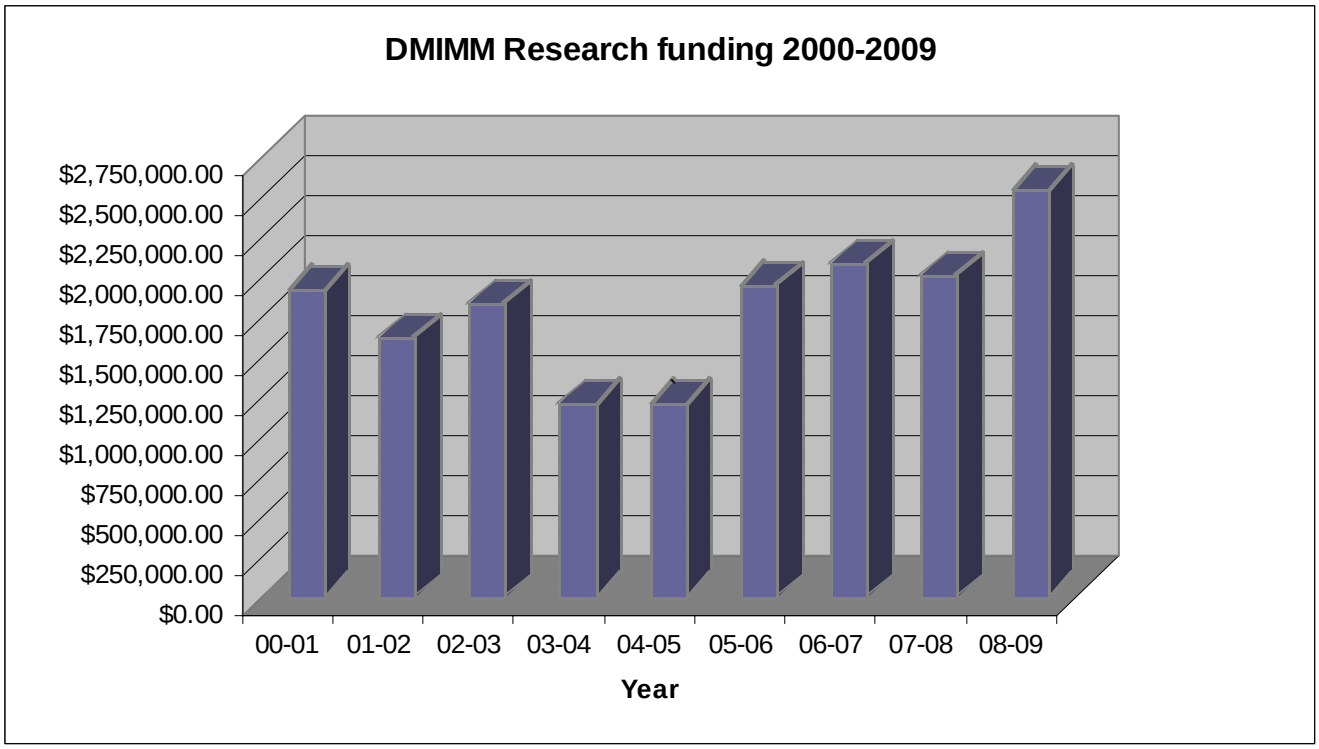
Dr. D. Sheppard:
FRSQ, New Investigator Award, 2008-2012

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

Year	*Budget*	*Expenses*	*Year end Balance*
2000	$ 1,449,466.25	$ 1,475,034.79	$ (25,568.54)
2001	$ 1,450,541.25	$ 1,429,937.08	$ 20,604.17
2002	$ 1,503,403.88	$ 1,480,459.09	$ 22,944.79
2003	$ 1,527,774.84	$ 1,490,302.64	$ 37,472.20
2004	$ 1,630,553.00	$ 1,672,631.71	$ (42,078.71)
2005	$ 1,787,923.00	$ 1,841,163.83	$ (53,240.83)
2006	$ 1,822,645.00	$ 1,933,009.18	$ (110,364.18)
2007	$ 1,804,901.00	$ 1,890,154.01	$ (85,253.01)
2008	$ 1,854,067.00	$ 1,961,837.66	$ (107,770.66)
2009	$ 1,874,605.00	$ 1,850,446.14	$ 24,158.86

APPENDIX I – Publication of primary and secondary faculty

Publications – Primary Faculty

ALI-KHAN, Zafer

Ali-Khan, Z. 2007. Serum amyloid A and AA amyloidosis. In Protein Reviews Vol 6. Protein misfolding, aggregation and conformational change. Part B. Molecular mechanisms of conformational diseases. Pp. 241-251. Publisher Springer Edts V .M. Uversky and A. Fink.

Sheen H, **Ali-Khan, Z.** 2005. Protein sample concentration by repeated loading onto SDS-PAGE.. Analy Biochem 343, 338-340.

Phipps-Yonas H, Pinard G, **Ali-Khan Z.**2004. Humoral pro-inflammatory cytokines and SAA generation profiles and spatio-temporal relationship between SAA and lysosomal cathepsin B and D in murine splenic monocytoid cells during AA amyloidosis. Scand J Immunol 168-176

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Qatani, F, Deschenes, J, **Ali-Khan, Z,** Maclean, J D, Codere, F, Mansour, M, Burnier, M 2000. Intraocular gnathstomiasis: a rare Canadian case. Canad J Opthalmology 35, 35-39.

BAINES, Malcolm G.

LePage, C., Genin P., **Baines M.G.** and Hiscott J. Interferon Activation and Innate Immunity. Reviews in Immunogenetics, 2:374-386, 2000.

Baines, M.G. Olfactory Stimuli and Allo-recognition. Neuroimmune Biology, Berczi I. and Gorczynski R. M. (Eds), 1: (313-329), 2001.

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BRIEDIS, Dalius J.

Briedis, D.J., Khamessian, A., McLaughlin, R.W., Vali, H., Panaritou, M., and Chan, E.C.S. Isolation of *Campylobacter fetus* subsp. *fetus* from a patient with cellulitis. *J. Clin. Micro*. 40:4792-4796, 2002.

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Patel, V.L., Arocha, J.F., Chaudhar, S.,Karlin, D.R., **Briedis, D.J.** Knowledge Integration and Reasoning as a Function of Instruction in a Hybrid Medical Curriculum. *J. Dent. Educ*. 69:1186-1211, 2005.

Briedis, D.J. "Orthomyxoviruses", pp. 248-261 *In*, Fundamentals of Molecular Virology, N.H. Acheson, ed. , John Wiley & Sons, December, 2006.

Briedis, D.J. "Prions", pp. 323-332 *In*, Fundamentals of Molecular Virology, N.H. Acheson, ed. , John Wiley & Sons, December, 2006.

COULTON, James W.

Gouré, J., Findlay, W.A., Deslandes, V., Bouevitch, A., Foote, S.J., MacInnes, J.I., **Coulton, J.W.**, Nash, J.H.E., and Jacques, M. (2009) Microarray-based comparative genomic profiling of reference strains and selected Canadian field isolates of *Actinobacillus pleuropneumoniae BMC Genomics* 10:88 (15 pages)

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Deslandes, V., Nash, J.H.E., Harel, J., **Coulton, J.W.**, and Jacques, M. (2007) Transcriptional profiling of *Actinobacillus pleuropneumoniae* under iron-restricted conditions. *BMC Genomics* 8:72 (20 pages)

Pawelek, P.D., Croteau, N., Ng-Thow-Hing, C., Khursigara, C.M., Moiseeva, N., Allaire, M., and **Coulton, J.W.** (2006) Structure of TonB in complex with FhuA, *E. coli* outer membrane receptor. *Science* 312:1399-1402.

Carter, D.M., Miousse, I.R., Gagnon, J.-N., Martinez, É., Clements, A., Lee, J., Hancock, M.A., Gagnon, H., Pawelek, P.D., and **Coulton, J.W.** (2006) Interactions between TonB from *Escherichia coli* and the periplasmic protein FhuD. *Journal of Biological Chemistry* 281:35413-35424.

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Lerner-Ellis, J.P., Tirone, J.C., Pawelek, P.D., Doré, C., Atkinson, J.L., Watkins, D., Morel, C.F., Fujiwara, T.M., Moras, E., Angela R. Hosack, A.R., Dunbar, G.V., Antonicka, H., Forgetta, V., Dobson, C.M., Leclerc, D., Gravel, R.A., Shoubridge, E.A., **Coulton, J.W.**, Lepage, P., Rommens, J.M., Morgan, K., and Rosenblatt, D.S. (2006) Identification of the gene responsible for methylmalonic aciduria and homocystinuria, *cblC* type *Nature Genetics* 38:93-100.

Shakarji, L., Mikael, L.G., Srikumar, R., Kobisch, M., **Coulton, J.W.**, and Jacques, M. (2006) FhuA and HgbA, outer membrane proteins of *Actinobacillus pleuropneumoniae*: their role as virulence determinants. *Canadian Journal of Microbiology* 52:391-396.

Eisenhauer, H.A., Shames, S., Pawelek, P.D., and **Coulton, J.W.** (2005) Siderophore transport through *Escherichia coli* outer membrane receptor FhuA with disulfide-tethered cork and barrel domains. *Journal of Biological Chemistry* 280:30574-30580.

Khursigara, C.M., De Crescenzo, G., Pawelek, P.D., and **Coulton, J.W.** (2005) Deletion of the proline-rich region of TonB disrupts formation of a 2:1 complex with FhuA, an outer membrane receptor of *Escherichia coli*. *Protein Science* 14:1266-1273.

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Srikumar, R., Mikael, L.G., Pawelek, P.D., Khamessan, A., Gibbs, B.F., Jacques, M., and Coulton, J.W. (2004) Molecular cloning of hemoglobin-binding protein HgbA in the outer membrane of *Actinobacillus pleuropneumoniae.* *Microbiology* 150:1723-1734.

Krylova, S.M., Rozenberg, D., **Coulton, J.W.**, and Krylov, S.N. (2004) Monitoring viral DNA release with capillary electrophoresis. *The Analyst* 129:1234-1237.

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Arbing, M.A., Hanrahan, J.W., and **Coulton, J.W.** (2001) Mutagenesis identifies amino acid residues in extracellular loops and within the barrel lumen that determine voltage gating of porin from *Haemophilus influenzae* type b. *Biochemistry* 40:14621-14628.

Ferguson, A.D., Ködding, J., Walker, G., Bös, C., **Coulton, J.W.**, Diederichs, K., Braun, V., and Welte, W. (2001) Active transport of an antibiotic rifamycin derivative by the outer membrane protein FhuA. *Structure* 9:707-716.

Ferguson, A.D., **Coulton, J.W.**, Diederichs, K., and Welte, W. (2001) The ferric hydroxamate uptake receptor FhuA and related TonB-dependent transporters in the outer membrane of gram-negative bacteria. *Handbook of Metalloproteins*, ed. A. Messerschmidt, R. Huber, T. Poulos, and K. Wieghardt, pp. 834-849; John Wiley & Sons, Chichester, U.K.

Arbing, M.A., Dahan, D., Boismenu, D., Mamer, O.A., Hanrahan, J.W., and **Coulton, J.W.** (2000) Charged residues in surface-located loops influence voltage gating of porin from *Haemophilus influenzae* type b. *Journal of Membrane Biology* 178:185-193.

Ferguson, A.D., Welte, W., Hofmann, E., Lindner, B., Holst, O., **Coulton, J.W.**, and Diederichs, K. (2000) A conserved structural motif for lipopolysaccharide recognition by procaryotic and eucaryotic proteins. *Structure* 8:585-592.

Ferguson, A.D., Braun, V., Fiedler, H.-P., **Coulton, J.W.**, Diederichs, K, and Welte, W. (2000)
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Belhocine, K., Mak, A., and **Cousineau, B.** (2007) Trans-splicing of the Ll.LtrB group II intron in *Lactococcus lactis*. Nucleic Acids Research 35(7), 2257-2268.

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Belfort, M., Derbyshire, V., Parker, M.M., **Cousineau, B.** and Lambowitz, A.M. (2002) Mobile Introns: Pathways and Proteins. *In* N.L. Craig et al. (ed.), Mobile DNA II, ASM Press, Washington, D.C. 761 784.

Cousineau, B. , Lawrence, S., Smith, D. and Belfort, M. (2000) Retrotransposition of a bacterial group II intron. Nature 404, 1018-1021.

GOTTE, Matthias

4.1. Refereed papers and review articles

***corresponding author, trainees are underlined**

1. Tchesnokov EP, Obikhod A, Massud I, Lisco A, Vanpouille C, Brichacek B, Balzarini J, McGuigan C, Derudas M, Margolis L, Schinazi RF, **Götte M***. Mechanisms associated with HIV-1 resistance to acyclovir by the V75I mutation in reverse transcriptase. J Biol Chem. 2009 Jun 9. [Epub ahead of print]

2. Beilhartz GL, Wendeler M, Baichoo N, Rausch J, Le Grice S, **Götte M***
HIV-1 Reverse Transcriptase Can Simultaneously Engage its DNA/RNA Substrate at the DNA Polymerase and RNase H Active Sites: Implications for RNase H Inhibition. J Mol Biol. 2009 May 8;388(3):462-74

3. Castro C, Smidansky ED, Arnold JJ, Maksimchuk KR, Moustafa I, Uchida A, **Götte M**, Konigsberg W, Cameron CE. Nucleic acid polymerases employ a general acid for nucleotidyl transfer.
Nat Struct Mol Biol. 2009 Feb;16(2):212-8

4. Wendeler M, Beilhartz GL, Beitler JA, **Götte M**, Le Grice SFJ
HIV ribonuclease H: continuing the search for small molecule antagonists
HIV Therapy. January 2009, Vol. 3, No. 1, Pages 39-53, Review

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

susceptibility. AIDS Rev. 2008 Oct-Dec;10(4):224-35, Review

6. Tchesnokov EP, Obikhod A, Schinazi RF, **Götte M***.
Delayed chain termination protects the anti-hepatitis B virus drug entecavir from excision by HIV-1 reverse transcriptase. J Biol Chem. 2008 Dec 5;283(49):34218-28

7. Dash, C., Scarth, B., Badorrek, C., **Götte, M**., and Le Grice, S.F.J. (2008)
Examining the ribonuclease H primer grip of HIV-1 reverse transcriptase by charge neutralization of RNA/DNA hybrids. Nucleic Acids Res. Nucleic Acids Res. 2008 Nov;36(20):6363-71

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9. Lisco A, Vanpouille C, Tchesnokov EP, Grivel JC, Biancotto A, Brichacek B, Elliott J, Fromentin E, Shattock R, Anton P, Gorelick R, Balzarini J, McGuigan C, Derudas M, **Götte M**, Schinazi RF, Margolis L. Acyclovir is activated into a HIV-1 reverse transcriptase inhibitor in herpesvirus-infected human tissues. Cell Host Microbe. 2008 Sep 11;4(3):260-70.

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11. Ehteshami M, Beilhartz GL, Scarth BJ, Tchesnokov EP, McCormick S, Wynhoven B, Harrigan PR, **Götte M***. Connection domain mutations N348I and A360V in HIV-1 reverse transcriptase enhance resistance to 3'-azido-3'-deoxythymidine through both RNase H-dependent and -independent mechanisms. J Biol Chem. 2008 Aug 8;283(32):22222-32. Epub 2008 Jun 10.

12. **Götte M***.
Should we include connection domain mutations of HIV-1 reverse transcriptase in HIV resistance testing? PLoS Med. 2007 Dec;4(12), Perspective

13. Marchand B, White KL, Ly JK, Margot NA, Wang R, McDermott M, Miller MD, **Götte M***
Effects of the Translocation Status of HIV-1 Reverse Transcriptase on the efficiency of excision of tenofovir. Antimicrob Agents Chemother. 2007 Aug;51(8):2911-9.

14. Deval J, Powdrill MH, D'Abramo CM, Cellai L, **Götte M***.
Pyrophosphorolytic Excision of non-obligate chain-terminators by Hepatitis C Virus NS5B Polymerase Antimicrob Agents Chemother. 2007 Aug;51(8):2920-8.

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High Resolution Footprinting of the Hepatitis C Virus Polymerase NS5B in Complex with RNA.
J Biol Chem. 2007 Jun 8;282(23):16907-16.

16. Castro C, Smidansky E, Maksimchuk KR, Arnold JJ, Korneeva VS, Götte M, Konigsberg W, Cameron CE.
Two proton transfer reactions in the rate-limiting transition for nucleotidyl transfer catalyzed by RNA- and DNA-dependent RNA and DNA polymerases. Proc Natl Acad Sci USA 2007 Mar 13;104(11):4267-72.

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***
Mechanisms of resistance associated with excision of incorporated nucleotide analogue inhibitors of HIV-1 reverse transcriptase. Current Opinion in HIV and AIDS 2007, 2:103-107, Review

19. Klarmann GJ, Eisenhauer BM, Zhang Y, **Götte M** , Pata JD, Chatterjee DK, Hecht SM, Le Grice SF
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

20. Marchand B, Tchesnokov EP, **Götte M. ***
The Pyrophosphate Analogue Foscarnet Traps the Pre-translocated state of HIV-1 Reverse Transcriptase in a Brownian Ratchet Model of Translocation. J Biol Chem. 2007 Feb 2;282(5):3337-46.

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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
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APPENDIX I. I - Patents and Reports of inventions

Patent No.	Issue/Filing Date	Patent/Application Serial No.	Inventor	Title	Status
1	9/1/2000	US00/24129 (PCT)	Robert A. Murgita	Use of RAFP to Inhibit or Prevent Apoptosis	Expired
2	9/11/2001	6,288,034 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein as an Immunosuppressive Agent	Issued
3	12/18/2001	6,331,611 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein and Uses Thereof	Issued
4	7/9/2002	6,416,734 (U.S.)	Robert A. Murgita	Recombinant Alpha-Fetoprotein for Treating and Diagnosing Cancers	Issued
5	3/18/2003	6,534,479 (U.S.)	Robert A. Murgita	Recombinant Alpha-Fetoprotein Hybrid Cytotoxins for Treating and Diagnosing Cancers	Issued
6	9/30/2003	6,627,440 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein as a Cell Proliferative Agent	Issued
7	10/7/2003	6,630,445 (U.S.)	Robert A. Murgita	Recombinant Alpha-Fetoprotein for Treating Cancers	Issued
8	5/4/2004	10/838,476 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein as an Immunosuppressive Agent	Pending
9	5/19/2004	ZL96192764 (China)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein and Uses Thereof	Issued
10	8/10/2004	6,774,108 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein as an Immunosuppressive Agent	Issued
11	12/22/2004	E 285416 (Austria)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
12	12/22/2004	0 749 441 (European Patent Office)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
13	12/22/2004	0 749 441 (France)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
14	12/22/2004	692 33 463.7-08 (Germany)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
15	12/22/2004	0 749 441 (Italy)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
16	12/22/2004	0 749 441 (Liechtenstein)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
17	12/22/2004	2235156 (Spain)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-	Issued

				Fetoprotein	
Patent No.	**Issue/Filing Date**	**Patent/Application Serial No.**	**Inventor**	**Title**	**Status**
18	12/22/2004	93915109.8 (Sweden)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
19	12/22/2004	0 749 441 (Switzerland)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
20	12/22/2004	0 749 441 (UK)	Robert A. Murgita	Expression and Purification of Cloned Human Alpha-Fetoprotein	Issued
21	3/11/2005	1010153 (Hong Kong)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein and Uses Thereof	Issued
22	5/3/2005	11/120,753 (U.S.)	Robert A. Murgita	Use of RAFP to Inhibit or Prevent Apoptosis	Pending

Pending as of April 25, 2009					
23		2,120,131 (Canada)	Robert A. Murgita	Expression and Purification of Cloned Alpha-Fetoprotein	Pending
24		04076388.0 (European Patent Office)	Robert A. Murgita	Expression and Purification of Cloned Alpha-Fetoprotein	Pending
25		05107492.3 (Hong Kong)	Robert A. Murgita	Expression and Purification of Cloned Alpha-Fetoprotein	Pending
26		6-507567 (Japan)	Robert A. Murgita	Expression and Purification of Cloned Alpha-Fetoprotein	Pending
27		2,211,324 (Canada)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein and Uses Thereof	Pending
28		8-523001 (Japan)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein and Uses Thereof	Pending
29		08/879,469 (U.S.)	Robert A. Murgita	Recombinant Human Alpha-Fetoprotein as a Cell Proliferative Agent	Pending
30	10/29/2004	US Patent # US-2007-0041997-A1	Samantha Gruenheid	Bacterial virulence factors and uses thereof	Issued
31	10/29/2004	Brazil #1877	Samantha Gruenheid	Bacterial virulence factors and uses thereof	Issued
32	10/29/2004	South Africa	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
33	10/29/2004	European # 1692287	Samantha Gruenheid	Bacterial virulence factors and uses thereof	Issued

Patent No.	Issue/Filing Date	Patent/Application Serial No.	Inventor	Title	Status
34	10/29/2004	Norway	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
35	10/29/2004	Phillipines	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
36	10/29/2004	Mexico	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
37	10/29/2004	Columbia	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
38	11/02/2004	Argentina # AR050050 A1	Samantha Gruenheid	Bacterial virulence factors and uses thereof	Issued
39	10/29/2004	Berlarus	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
40	10/29/2004	Ukraine	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
41	10/29/2004	New Zealand	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
42	10/29/2004	China	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
43	10/29/2004	Russian Federation	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
44	10/29/2004	India	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
45	10/29/2004	Australia	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
46	10/29/2004	Republic of Korea	Samantha Gruenheid	Bacterial virulence factors and uses thereof	
47	10/29/2004	PCT # WO 2005/042746	Samantha Gruenheid	Bacterial virulence factors and uses thereof	Issued

Reports of Invention

Patent No.	Title	Inventor	Result
12/9/2005	06057 Technique to determine the precise position of HIV-1 RT on its nucleic acid substrate. Led to research agreement with third party generating revenues of $98K/yr from 2004 up until 2008	Matthias Götte	Led to research agreement with third party generating revenues of $98K/yr from 2004 up until 2008
7/04/2007	06108 Expression and purification of an alpha-like DNA polymerase.	Matthias Götte	Led to paid MTA with pharmaceutical company $8,000
11/08/2008	09024 Inhibition of elongation complexes of HCV NS5B polymerase.	Matthias Götte	Led to a new research contract with pharmaceutical company on $98 K

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).
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 introductionto 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) n
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.

MIMM 721 Ph.D. Research Progress Report 1.

(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.

MIMM 722 Ph.D. Research Progress Report 2.

(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. 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

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	189	4.10
212	-	-
413	102	4.03
314	178	3.29
323	115	3.19
324	126	3.54
386D	101	3.23
387	89	-
414	40	3.71
465	96	2.81
466	84	3.56
502	20	-
509	2	4.47

Student Course Evaluation 2001 – 2002

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	224	4.05
212	121	-
413	96	3.68
314	172	3.58
323	155	3.15
324	128	3.80
386D	91	3.27
387	55	-
414	35	3.96
465	-	-
466	104	2.94
502D	21	-
509	7	3.86

Student Course Evaluation 2002 – 2003

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	235	3.95
212	141	4.1
413	72	3.9
314	176	3.96
323	118	2.64
324	132	4.21
386D	107	3.26
387	61	4.87
414	24	4
465	86	4.11
466	82	4.2
502D	19	n/a
509	9	4.33

Student Course Evaluation 2003 – 2004

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	237	4.34
212	128	4.23
413	100	3.46
314	204	3.26
323	127	4.15
324	146	3.53
386D	115	4.44
387	73	3.78
414	35	4
465	98	3.86
466	105	4.11
502D	21	n/a
509	6	4.76

Student Course Evaluation 2004 – 2005

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	238	4.23
212	130	4.12
413	95	4.22
314	194	3.98
323	123	3.51
324	128	4.1
386D	105	3.16
387	100	4.2
414	36	4.02
465	112	4.57
466	105	4.08
502D	19	n/a
509	11	4.34

Student Course Evaluation 2005 – 2006

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	240	4.14
212	103	3.5
413	89	3.5
314	204	4.15
323	123	2.33
324	141	4.22
386D	112	2.44
387	53	4.61
414	40	3.89
465	98	3.9
466	105	3.85
502D	20	4.42
509	15	4.5

Student Course Evaluation 2006 – 2007

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	287	4.02
212	119	4.08
413	102	3.71
314	209	3.93
323	81	2.98
324	106	3.85
386D	83	3.16
387	40	4.13
414	50	4.04
465	112	4.01
466	116	3.68
502D	28	4.8
509	14	4.29

Student Course Evaluation 2007 – 2008

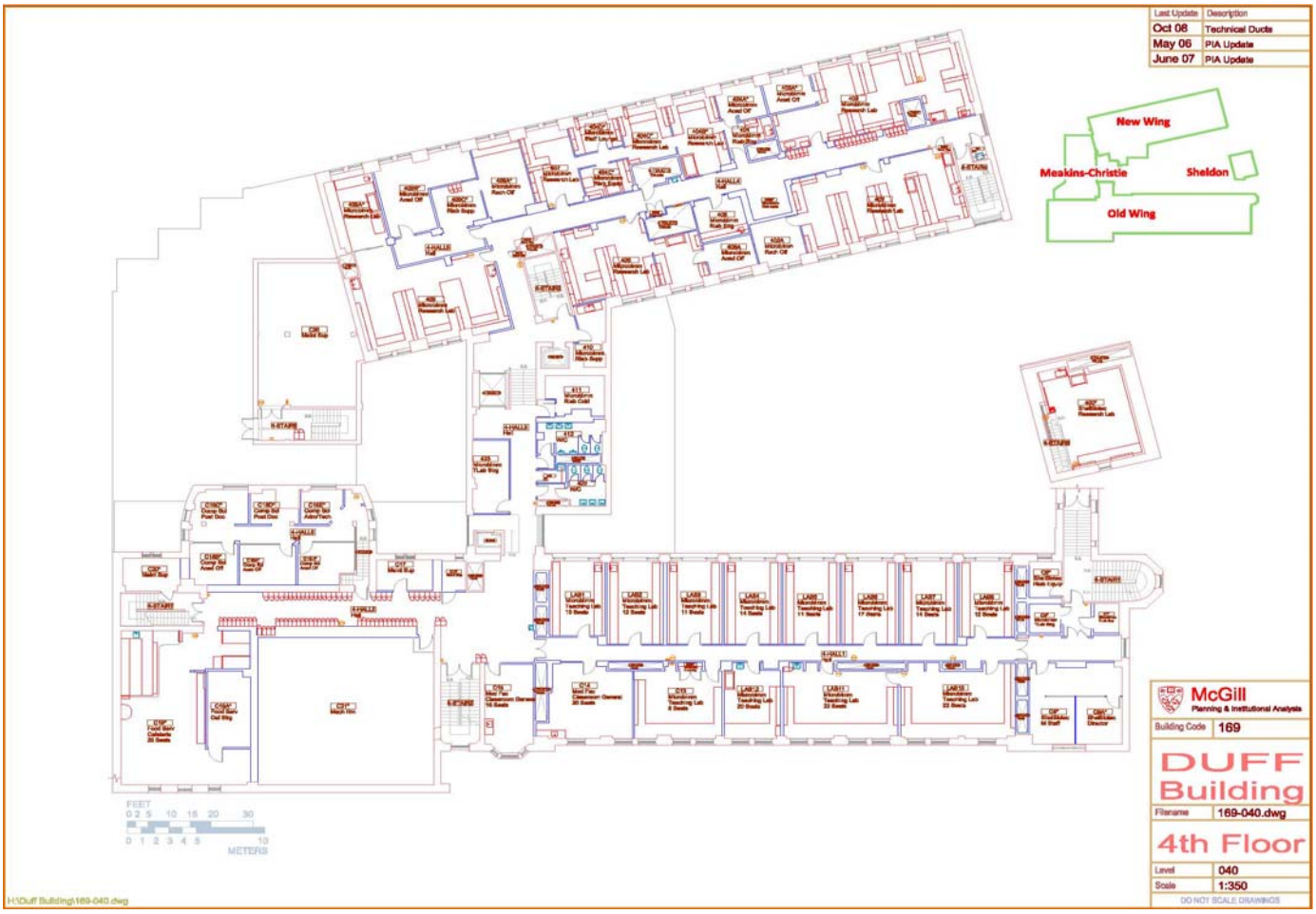
Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	293	4.09
212	116	3.91
413	63	3.97
314	192	3.97
323	93	3.10
324	115	4.08
386D	91	3.08
387	54	3.98
396	5	n/a
414	44	4.07
465	80	3.95
466	83	3.83
499	3	n/a
502D	12	5
509	13	4.27

Student Course Evaluation 2008 – 2009

Course number	Number of students registered	Evaluation (1 = poor; 5 = excellent)
211	235	3.8
212	107	3.8
413	92	3.7
314	218	3.7
323	101	3.8
324	122	3.6
386D	102	3.75
387	73	3.7
414	36	3.6
465	93	3.6
466	103	3.7
502D	23	4.85
509	7	3.95

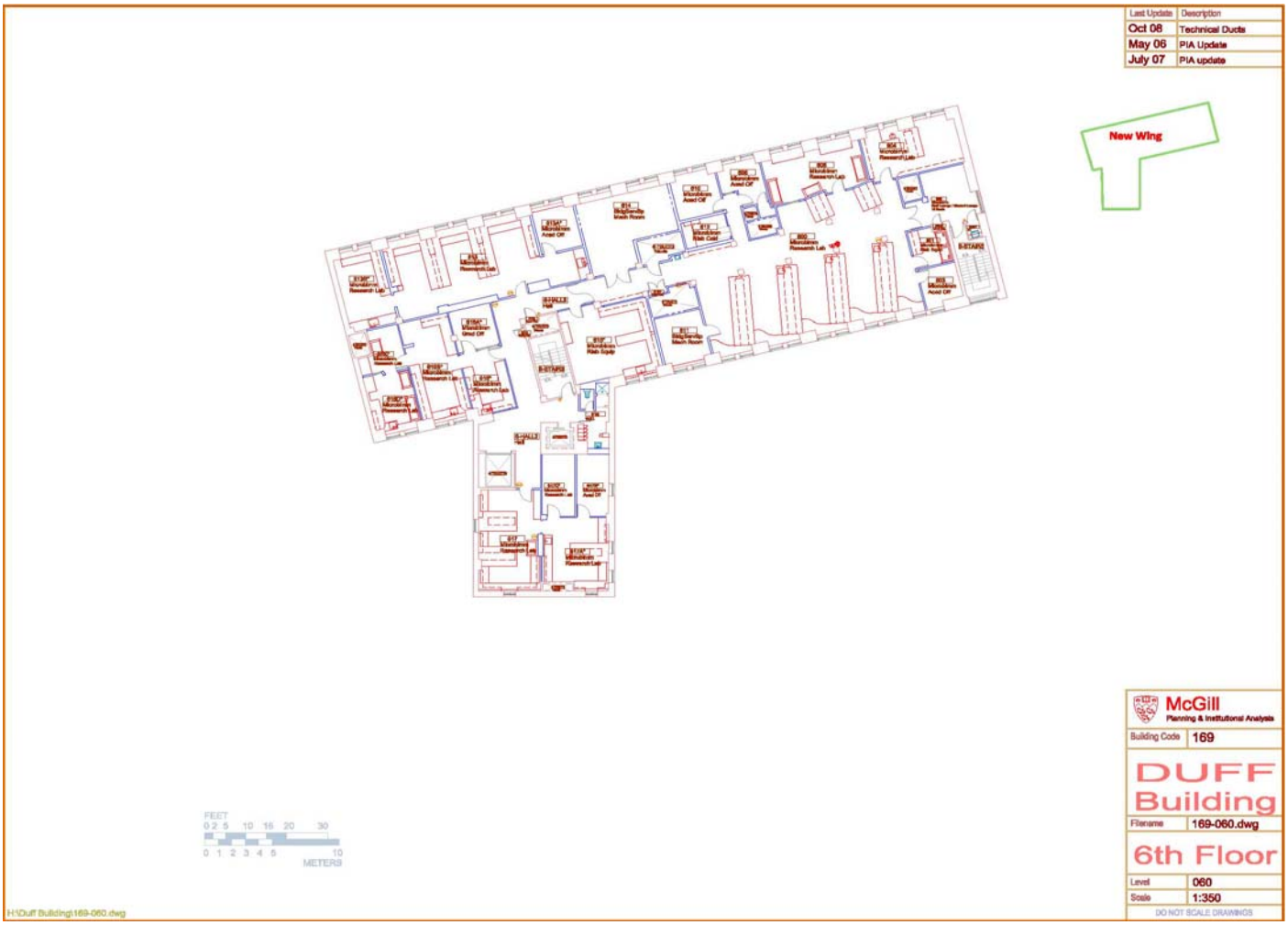
APENDIX IV – Research Facilities

Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
4th floor

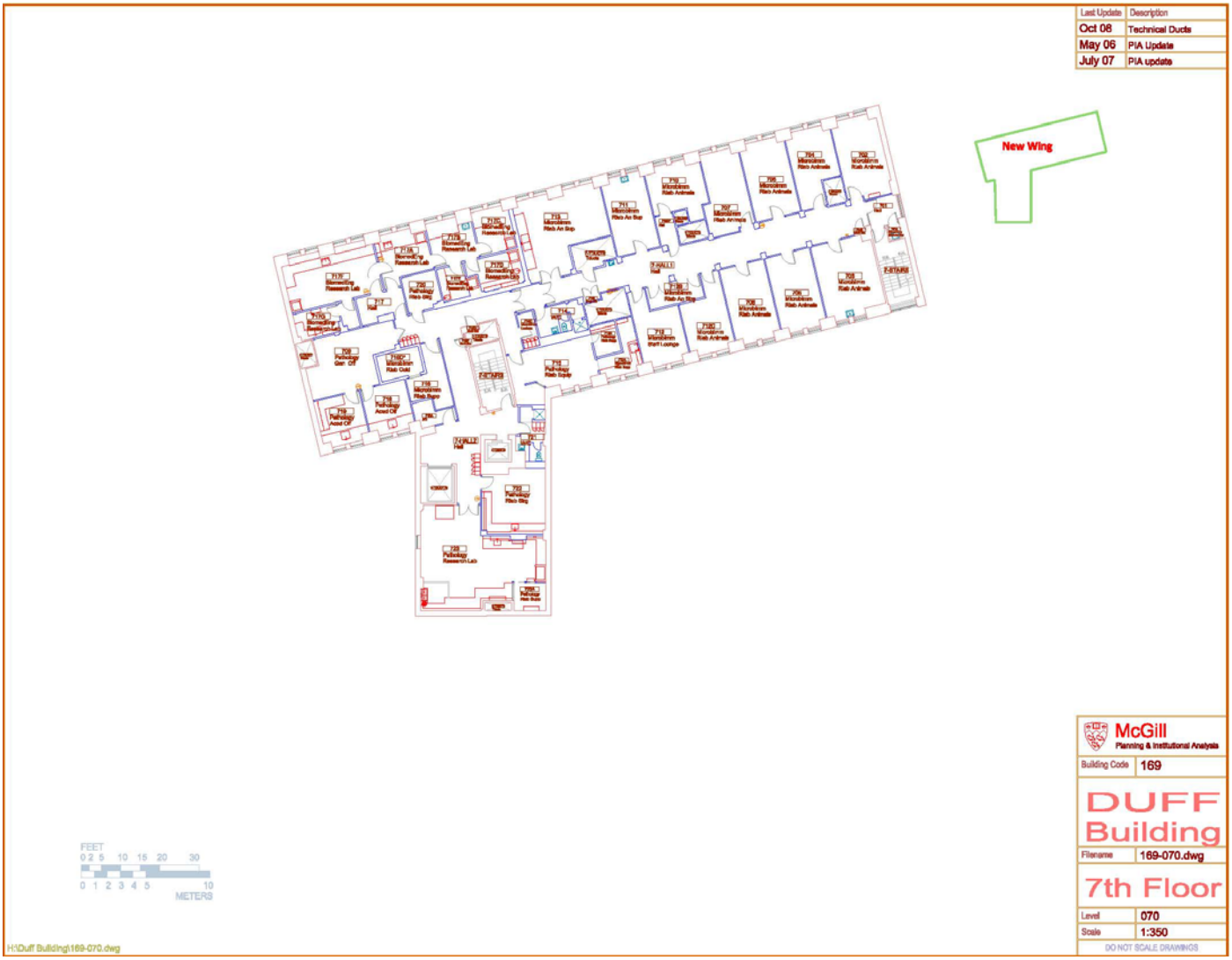


Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
5th floor

Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
6th floor



Department of Microbiology and Immunology
Floor plan – Lyman Duff Medical Building
7th floor – Animal Facility



APPENDIX V – List of Grants

Research Grants for 2000-2001

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
CIHR, Canadian Inst of Health Research						
225088	Polymavirus Large T Antigen: Role in Assembly of Dna Replication Complex	1-Apr-2000	31-Mar-2003	$ 78,932.00	Nicholas H	Acheson
200667	The role of macrophages and inflammation-associated host factors in amyloid A formation	1-Oct-2000	30-Sep-2003	$ 45,916.00	Zafer	Ali Khan
202044	Equipment for molecular biology and structural biology of bacterial membrane proteins	1-Oct-2001	31-Mar-2002	$ 65,000.00	James	Coulton
224766	Structural Biology Of Bacterial Membrane Proteins	1-Apr-1999	31-Mar-2013	$ 62,233.00	James	Coulton
229763	Studies On Transposable Phages Mu, D108 And D3112	1-Apr-1999	31-Mar-2001	$ 91,612.00	Michael S	Dubow
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	1-Mar-2001	30-Jun-2004	$ 61,875.00	Sylvie	Fournier
201289	Transmembrane Signaling by histidine kinase sensors	1-Apr-2001	31-Mar-2004	$ 51,000.00	Herve	Le-Moual
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	1-Apr-1999	31-Mar-2010	$ 72,161.00	Gregory T	Marczynski
222326	Papillomavirus And Leishmania Infections	1-Jul-1999	30-Jun-2004	$ 70,000.00	Greg J	Matlashewski
229829	Molecular Characterisation Of Leishmania Infection	1-Apr-1999	30-Sep-2011	$ 79,760.00	Greg J	Matlashewski
220687	Interdepartmental Flow Cytometry Facility	1-Jan-2000	30-Jun-2005	$ 48,450.00	Trevor	Owens
221554	Control Of B Lymphocyte Ontogeny			$ 80,456.00	Michael J	Ratcliffe
Sapientia Therapeutics Ltd						

223822	Title: Comparison Of Three Immunogenic Peptides Encapsulated In Lipid Complexes Containing Adjuvant Lipids In Mice	1-Apr-1999	31-Mar-2005	$	15,000.00	Malcolm	Baines
224095	Title: "Assessment Of The Dose Response Relationships Of Liposome Encapsulated Immunogenic Peptides….."	1-Apr-1999	31-Dec-2000	$	15,000.00	Malcolm	Baines
Natural Sciences and Engineering Research Council of Canada							
228086	Outer Membrane Proteins For Iron Uptake: Candidate Vaccine Against Actinobacillus Pleuropneumoniae	1-Nov-1999	31-Jan-2002	$	47,750.00	James	Coulton
201231	Lowspeed Refrigerated Centrifuge	1-Apr-2000	31-Mar-2001	$	40,000.00	James	Coulton
201373	Equipment For Molecular Membrane Biology	1-Apr-2000	31-Mar-2001	$	27,809.00	James	Coulton
201618	Research Network On Bacterial Pathogens Of Swine	1-Apr-2000	31-Mar-2004	$	28,000.00	James	Coulton
224561	Bacterial Iron Transporters	1-Apr-2006	31-Mar-2007	$	40,000.00	James	Coulton
221606	Detection des Xenobiltiques par Luminescence bacterienne	1-Apr-2000	31-Mar-2006	$	4,000.00	Michael S	Dubow
228314	Identification And Characterization Of NewGenetics Responses Ub Escgerucgua CikuAbd Gynab (Hela) Cells	1-Apr-1998	31-Mar-2003	$	34,650.00	Michael S	Dubow
222892	Membrane Biogenesis And Developmental Transcription Control	1-Apr-1996	31-Mar-2004	$	46,900.00	Gregory T	Marczynski
223349	Molecular Analysis Of Two Common Polymorphic Variants Of Wildtype P53	1-Apr-1999	31-Mar-2004	$	63,630.00	Greg J	Matlashewski
Faculty of Medicine - Internal Funding							
200411	Medicine Special Allocation - Internal Funding, Faculty of Medicine	N/A	N/A	$	130,000.00	Sylvie	Fournier
200412	Medicine Special Allocation - Internal Funding, Faculty of Medicine	N/A	N/A	$	130,000.00	Herve	Le-Moual

World Health Organization							
227966	Novel Approaches For An Anti-Leishmania Vaccine	1-Sep-1998	1-Aug-2001	$	24,522.00	Greg J	Matlashewski
FRSQ							
201752	FRSQ chercheur boursier	1-Jul-2000	30-Jun-2005	$	48,391.00	Herve	Le-Moual
202031	Transmission du signal a travers la membrane par les recepteurs bacteriens possedant une activite histidine kinase	1-Jul-2000	30-Jun-2001	$	20,774.94	Herve	Le-Moual
National Cancer Institute (NCI)							
228432	P53-E6 interactions and human Papillomavirus Associated Cervical Cancer	1-Jul-1997	30-Jun-2002	$	45,703.00	Greg J	Matlashewski
Martinex Inc							
201953	Strategy for design of functionally active recombinant AFP peptides (Subcontract ABI)	1-Jul-2001	30-Jun-2004	$	351,120.00	Robert A	Murgita

Total for 2000-01: $1,920,644.94

Research Grants for 2001-2002

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name
CIHR, Canadian Inst of Health Research					
202561	Development of a Vaccine Against Canine Leishmaniasis	01-Apr-2001	15-Dec-2004	$ 90,000.00	Greg J Matlashewski
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 59,161.00	Gregory T Marczynski
224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$ 76,466.00	James W Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$ 173,051.83	Greg J Matlashewski
FRSQ					
202031	Transmission du signal a travers la membrane par les recpteurs bacteriens possedant une activite histidine kinase	01-Jul-2000	29-May-2003	$ 20,775.00	Herve Le-Moual
202754	Mobilite des introns du groupe II : mecanismes et applications	01-Jul-2001	03-Oct-2003	$ 20,000.00	Benoit Cousineau
Martinex Inc					
201953	Strategy for design of functionally active recombinant AFP peptides (Subcontract ABI)	01-Jul-2001	30-Jul-2007	$ 175,560.00	Robert A Murgita
229925	Title: Strategy For Design Of Functionally Active Recombin- Ant Afp Peptides.	01-Jan-1999	28-Feb-2006	$ 51,814.41	Robert A Murgita
Medical Research Council of Canada					
200667	The role of macrophages and inflammation-associated host factors in amyloid A formation	01-Apr-2000	07-Dec-2005	$ 60,076.00	Zafer Ali Khan
201140	Gene Regulation in Transposable Bacteriophages and their Hosts	01-Apr-2001	11-Aug-2004	$ 85,102.00	Michael S Dubow
201289	Transmembrane Signaling by histidine kinase sensors	01-Apr-2001	03-Aug-2005	$ 51,000.00	Herve Le-Moual
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	01-Apr-2001	27-Jan-2006	$ 61,875.00	Sylvie Fournier
202250	Mechanism of mobility and applications of group II introns mobility	01-Apr-2001	20-Dec-2007	$ 32,084.00	Benoit Cousineau
202354	Mechanisms and applications of group II intron mobility	01-Apr-2001	17-Feb-2006	$ 106,396.91	Benoit Cousineau

222326	Mrc Senior Scientist For Pr0f.G.J.Matlashewshi Title: Papillomavirus And Leishmania Infections	01-Apr-1999	28-May-2007	$	82,873.28	Greg J	Matlashewski
225088	Polyomavirus Large T Antigen: Role in Assembly of Dna Replication Complex	01-Apr-2000	03-Jan-2005	$	78,932.00	Nicholas H	Acheson
National Cancer Institute (NCI)							
228432	P53-E6 interactions and human Papillomavirus Associated Cervical Cancer	01-Jul-1998	05-Dec-2003	$	45,703.00	Greg J	Matlashewski
Natural Sciences and Engineering Research Council of Canada							
201373	Equipment For Molecular Membrane Biology	01-Apr-2000	25-Feb-2005	$	27,809.00	James W	Coulton
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$	47,908.00	Benoit	Cousineau
222892	Membrane Biogenesis And Developmental Transcription Control	01-Apr-1996	21-Feb-2007	$	46,900.00	Gregory T	Marczynski
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$	63,630.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	40,000.00	James W	Coulton
228314	Identification And Characterization Of New Genetic Responses In Escherichia Coli And Human (HeLa) Cells	01-Apr-1998	16-Nov-2004	$	34,650.00	Michael S	Dubow
Universite de Montreal							
201618	Reserach Network On Bacterial Pathogens Of Swine	01-Apr-2000	30-Sep-2005	$	28,000.00	James W	Coulton
228086	Outer Membrane Proteins For Iron Uptake: Candidate Vaccine Against Actinobacillus Pleuropneumoniae	01-Nov-1999	25-Feb-2005	$	48,250.00	James W	Coulton
229202	To Record The Research Project	01-Jun-1998	07-Sep-2005	$	21,750.00	James W	Coulton

Total for 2001-02: **$1,629,767.43**

Research Grants for 2003-2004

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
CIHR, Canadian Inst of Health Research						
201384	Role of B7.2/CD28 in maintaining B lymphocyte homeostasis	01-Apr-2000	07-Jun-2006	$ 77,400.00	Sylvie	Fournier
204845	Molecular interactions of energy transducing proteins in bacteria	01-Apr-2003	22-Feb-2007	$ 63,735.00	James W	Coulton
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 94,072.00	Gregory T	Marczynski
224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$ 76,466.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$ 119,342.00	Greg J	Matlashewski
FRSQ						
202831	Role de la molecule B7.2 dans le maintien de l'homeostasie du lymphocyte B et la reponse specifique a l'antigene des lymphocytes T	01-Apr-2000	24-Feb-2004	$ 2,721.74	Sylvie	Fournier
Fonds de recherche sur lat nature (FQRNT)						
205918	Centre for Host Parasite Interactions	01-Apr-2003	31-Mar-2009	$ 8,000.00	Greg J	Matlashewski
Medical Research Council of Canada						
200667	The role of macrophages and inflammation-associated host factors in amyloid A formation	01-Apr-2000	07-Dec-2005	$ 37,548.00	Zafer	Ali Khan
201140	Gene Regulation in Transposable Bacteriophages and their Hosts	01-Apr-2001	11-Aug-2004	$ 69,784.00	Michael S	Dubow
201289	Transmembrane Signaling by histidine kinase sensors	01-Apr-2001	03-Aug-2005	$ 77,066.00	Herve	Le-Moual
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	01-Apr-2001	27-Jan-2006	$ 66,209.63	Sylvie	Fournier
202250	Mechanism of mobility and applications of group II introns mobility	01-Apr-2001	20-Dec-2007	$ 63,163.05	Benoit	Cousineau
202354	Mechanisms and applications of group II intron mobility	01-Apr-2001	17-Feb-2006	$ 7,871.00	Benoit	Cousineau
222326	Mrc Senior Scientist For Pr0f.G.J.Matlashewshi Title: Papillomavirus And Leishmania Infections	01-Apr-1999	28-May-2007	$ 89,734.08	Greg J	Matlashewski

Natural Sciences and Engineering Research Council of Canada							
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$	29,000.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$	24,400.00	Sylvie	Fournier
205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$	32,200.00	Herve	Le-Moual
222892	Membrane Biogenesis And Developmental Transcription Control	01-Apr-1996	21-Feb-2007	$	46,900.00	Gregory T	Marczynski
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$	63,630.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	40,000.00	James W	Coulton
228314	Identification And Characterization Of New Genetic Responses In Escherichia Coli And Human (HeLa) Cells	01-Apr-1998	16-Nov-2004	$	38,530.00	Michael S	Dubow
Universite de Montreal							
201618	Reserach Network On Bacterial Pathogens Of Swine	01-Apr-2000	30-Sep-2005	$	22,462.50	James W	Coulton
206021	Regulation de l'expression des genes de virulence chez actinobacillus actinomycetemcomitans	01-Apr-2003	04-May-2007	$	25,000.00	Herve	Le-Moual
229202	To Record The Research Project	01-Jun-1998	07-Sep-2005	$	14,000.00	James W	Coulton
Valorisation Recherche Quebec							
203079	Mise au point, developpement et mise en application de systemes moleculaires de relargage cible pour des vaccines a usage veterinaire.	01-Apr-2002	03-Aug-2006	$	20,200.00	James W	Coulton
World Health Organization							
227836	Title: Novel Approaches To An Anti-Leishmania Vaccine Period:	01-Jun-1997	20-May-2005	$	-	Greg J	Matlashewski
221606	Detection Des Xenobiltiques Par Luminescence Bacterienne	30-Sep-1999	20-Oct-2005	$	6,200.00	Michael S	Dubow

Total for 2003-04: **$1,215,635.00**

Research Grants for 2004-2005

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
Burroughs Wellcome Fund						
207520	Isolation and characterization of genes involved in morphogenesis and virulence of aspergillus fumigatus	01-Sep-2004	31-Aug-2009	$ 130,000.00	Donald	Sheppard
CIHR, Canadian Inst of Health Research						
201384	Role of B7.2/CD28 in maintaining B lymphocyte homeostasis	01-Apr-2000	07-Jun-2006	$ 38,700.00	Sylvie	Fournier
204845	Molecular interactions of energy transducing proteins in bacteria	01-Apr-2003	22-Feb-2007	$ 63,735.00	James W	Coulton
206656	CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes	01-Apr-2003	31-Mar-2013	$ 118,110.00	Ciriaco	Piccirillo
207179	Development of a new generation of live vaccines using Lactococcus lactis	01-Apr-2003	15-Nov-2006	$ 60,000.00	Benoit	Cousineau
207741	Molecular analysis of HPV infection in precancerous and cancerous lessions of the uterine cervix	01-Apr-2004	31-Mar-2009	$ 15,000.00	Greg J	Matlashewski
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 94,072.00	Gregory T	Marczynski
224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$ 76,466.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$ 119,342.00	Greg J	Matlashewski
Fonds de recherche sur lat nature (FQRNT)						
205918	Centre for Host Parasite Interactions	01-Apr-2003	31-Mar-2009	$ 22,700.00	Greg J	Matlashewski
207773	Centre for Host-Parasite Interactions	01-Apr-2004	31-Mar-2009	$ 7,400.00	Ciriaco	Piccirillo
Medical Research Council of Canada						
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	01-Apr-2001	27-Jan-2006	$ 13,750.00	Sylvie	Fournier
202250	Mechanism of mobility and applications of group II introns mobility	01-Apr-2001	20-Dec-2007	$ 58,424.00	Benoit	Cousineau
222326	Mrc Senior Scientist For Pr0f.G.J.Matlashewshi Title: Papillomavirus And	01-Apr-1999	28-May-2007	$ 19,250.00	Greg J	Matlashewski

	Leishmania Infections						
225088	Polyomavirus Large T Antigen: Role in Assembly of Dna Replication Complex	01-Apr-2000	03-Jan-2005	$	(505.46)	Nicholas H	Acheson
229763	Studies On Transposable Phages Mu, D108 And D3112	01-Apr-1995	07-Jan-2005	$	894.66	Michael S	Dubow
Natural Sciences and Engineering Research Council of Canada							
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$	29,000.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$	24,400.00	Sylvie	Fournier
205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$	32,200.00	Herve	Le-Moual
207521	Reverse Vaccinology, A Genomics Approach To Vaccine Development For A. Pleuroneumoniae	01-Apr-2004	26-Nov-2008	$	146,000.00	James W	Coulton
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$	48,710.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	40,000.00	James W	Coulton
Universite de Montreal							
201618	Reserach Network On Bacterial Pathogens Of Swine	01-Apr-2000	30-Sep-2005	$	23,800.00	James W	Coulton
Valorisation Recherche Quebec							
203079	Mise au point, developpement et mise en application de systemes moleculaires de relargage cible pour des vaccines a usage veterinaire.	01-Apr-2002	03-Aug-2006	$	27,300.00	James W	Coulton

Total for 2004-05: **$1,208,748.20**

Research Grants for 2005-2006

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
Burroughs Wellcome Fund						
207520	Isolation and characterization of genes involved in morphogenesis and virulence of aspergillus fumigatus	01-Sep-2004	31-Aug-2009	$ 147,527.03	Donald	Sheppard
CIHR, Canadian Inst of Health Research						
204845	Molecular interactions of energy transducing proteins in bacteria	01-Apr-2003	22-Feb-2007	$ 73,248.00	James W	Coulton
206656	CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes	01-Apr-2003	31-Mar-2013	$ 118,110.00	Ciriaco	Piccirillo
207741	Molecular analysis of HPV infection in precancerous and cancerous lessions of the uterine cervix	01-Apr-2004	31-Mar-2009	$ 31,400.00	Greg J	Matlashewski
209251	Mechanisms involved in nucleic acid unwinding by the HCV NTPASE/HELICASE	01-Apr-2004	22-Apr-2009	$ 70,876.74	Matthias	Gotte
209252	Molecular mechanisms involved in HIV Drug Resistance to Different classes of RT inhibitors	01-Apr-2005	20-Nov-2008	$ 72,672.83	Matthias	Gotte
209448	Functional characterization of nieA, a novel Type III secredted virulence factor of enterohemorrhagic and enteropathogenic E. coli	01-Apr-2005	31-Mar-2010	$ 46,265.00	Samantha	Gruenheid
209473	Molecular mechanisms of oncogenesis by sheep retrovirus envelope proteins	01-Apr-2005	31-Mar-2011	$ 86,223.00	Shan-Lu	Liu
210110	Characterization of herpesvirus protein kinase and DNA polymerase mutations leading to antiviral drug resistance	01-Apr-2005	13-Feb-2009	$ 22,000.00	Matthias	Gotte
210158	Seldi-ToF MS in protozaoan infections: Protecting the Canadian blood supply	01-Apr-2004	12-Oct-2007	$ 10,000.00	Greg J	Matlashewski
210176	Signal transduction by the salmonella enterica phoP/phoQ two component regulatory system	01-Apr-2005	31-Mar-2010	$ 13,854.00	Herve	Le-Moual
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 160,037.00	Gregory T	Marczynski
224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$ 116,169.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$ 119,342.00	Greg J	Matlashewski

Canadian Diabetes Association							
209106	Tolerogenic functions of naturally-occuring CD4+CD25+regulatory T cells in type 1 of autoimmune diabetes	01-Jul-2005	23-Jan-2008	$	75,000.00	Ciriaco	Piccirillo
Cancer Research Society Inc							
209507	Mechanisms involved in hepatitis C virus RNA-dependent RNA polymerase inhibition and drug resistance	01-Sep-2004	20-Jan-2009	$	90,000.00	Matthias	Gotte
Harbor - UCLA Medical Center							
209982	Aspergillus angioinvasion and dissemination	01-Jun-2005	01-Oct-2008	$	17,664.00	Donald	Sheppard
Los Angeles Biomedical Research Institute							
210057	Development of New Models of Invasive Aspergillosis	03-Nov-2005	14-Aug-2009	$	29,732.00	Donald	Sheppard
Medical Research Council of Canada							
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	01-Apr-2001	27-Jan-2006	$	1,565.00	Sylvie	Fournier
202250	Mechanism of mobility and applications of group II introns mobility	01-Apr-2001	20-Dec-2007	$	13,911.00	Benoit	Cousineau
222326	Mrc Senior Scientist For Pr0f.G.J.Matlashewshi Title: Papillomavirus And Leishmania Infections	01-Apr-1999	28-May-2007	$	2,493.00	Greg J	Matlashewski
Natural Sciences and Engineering Research Council of Canada							
201389	Role de B7.2/CD28 dans le maintien de l'homeostasie du lymphocyte B	01-Apr-2001	27-Jan-2006	$	1,565.00	Sylvie	Fournier
202250	Mechanism of mobility and applications of group II introns mobility	01-Apr-2001	20-Dec-2007	$	13,911.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$	25,000.00	Sylvie	Fournier
205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$	32,200.00	Herve	Le-Moual
206249	Site-Specific Footprinting Of Protein-Nucleic Acid Complexes	01-Apr-2004	31-Mar-2010	$	64,920.00	Matthias	Gotte
207521	Reverse Vaccinology, A Genomics Approach To Vaccine Development For A. Pleuroneumoniae	01-Apr-2004	26-Nov-2008	$	152,000.00	James W	Coulton
208430	Core equipment for microbiology and immunology: centrifuges and rotors	01-Apr-2004	06-Mar-2007	$	41,788.00	James W	Coulton
223349	Function Of The Alternatively	01-Apr-1999	31-Mar-2015	$	48,710.00	Greg J	Matlashewski

	Spliced P53 Gene						
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	40,000.00	James W	Coulton
Tibotec Pharmaceuticals Limited							
206538	Biochemical Characterization of a Novel Class of Antiretroviral Compounds	01-Jun-2004	24-Mar-2009	$	196,700.00	Matthias	Gotte
Valorisation Recherche Quebec							
203079	Mise au point, developpement et mise en application de systemes moleculaires de relargage cible pour des vaccines a usage veterinaire.	01-Apr-2002	03-Aug-2006	$	21,300.00	James W	Coulton

Total for 2005-06: **$ 1,956,183.60**

Research Grants for 2006-2007

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
Burroughs Wellcome Fund						
207520	Isolation and characterization of genes involved in morphogenesis and virulence of aspergillus fumigatus	01-Sep-2004	31-Aug-2009	$ 2,000.00	Donald	Sheppard
CIHR, Canadian Inst of Health Research						
206656	CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes	01-Apr-2003	31-Mar-2013	$ 118,110.00	Ciriaco	Piccirillo
207741	Molecular analysis of HPV infection in precancerous and cancerous lessions of the uterine cervix	01-Apr-2004	31-Mar-2009	$ 31,400.00	Greg J	Matlashewski
207818	Molecular mechanisims involved in HIV drug resistance to different classes of RT inhibitiors	01-Apr-2004	30-Jun-2009	$ 59,986.00	Matthias	Gotte
208694	Caracterisation des voies signaletiques dependantes des tyrosines phosplhatases dans le developpement de d'asthme	01-Apr-2005	30-Aug-2008	$ 5,000.00	Martin	Olivier
209251	Mechanisms involved in nucleic acid unwinding by the HCV NTPASE/HELICASE	01-Apr-2004	22-Apr-2009	$ 83,600.00	Matthias	Gotte
209252	Molecular mechanisms involved in HIV Drug Resistance to Different classes of RT inhibitors	01-Apr-2005	20-Nov-2008	$ 85,860.00	Matthias	Gotte
209448	Functional characterization of nieA, a novel Type III secredted virulence factor of enterohemorrhagic and enteropathogenic E. coli	01-Apr-2005	31-Mar-2010	$ 92,529.00	Samantha	Gruenheid
209473	Molecular mechanisms of oncogenesis by sheep retrovirus envelope proteins	01-Apr-2005	31-Mar-2011	$ 101,556.00	Shan-Lu	Liu
210176	Signal transduction by the salmonella enterica phoP/phoQ two component regulatory system	01-Apr-2005	31-Mar-2010	$ 55,418.00	Herve	Le-Moual
210608	Live imaging of immune responses in secondary lymphoid tissues	01-Apr-2005	18-Nov-2008	$ 60,750.00	Ciriaco	Piccirillo
212091	Developmentally dependent virulence mechanisms of the invasive mold aspergillus fumigatus	01-Apr-2006	31-Mar-2011	$ 34,726.00	Donald	Sheppard
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 139,277.00	Gregory T	Marczynski

224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$	116,169.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$	130,347.00	Greg J	Matlashewski
Canadian Diabetes Association							
209106	Tolerogenic functions of naturally-occuring CD4+CD25+regulatory T cells in type 1 of autoimmune diabetes	01-Jul-2005	23-Jan-2008	$	75,000.00	Ciriaco	Piccirillo
Canadian Genetic Diseases Network (CGDN)							
210387	Infectious diseases and global health: genetic approach to the identification of host susceptibility factors and pathogen virulence determinants	01-Apr-2004	08-Sep-2006	$	63,603.86	Samantha	Gruenheid
Cancer Research Society Inc							
209507	Mechanisms involved in hepatitis C virus RNA-dependent RNA polymerase inhibition and drug resistance	01-Sep-2004	20-Jan-2009	$	60,000.00	Matthias	Gotte
Ebioscience							
211051	Sponsorship of European Congress of Immunology Travel Grant	19-Jun-2006	12-Nov-2007	$	1,444.44	Ciriaco	Piccirillo
Fonds de recherche sur lat nature (FQRNT)							
205918	Centre for Host Parasite Interactions	01-Apr-2003	31-Mar-2009	$	3,200.00	Greg J	Matlashewski
207773	Centre for Host-Parasite Interactions	01-Apr-2004	31-Mar-2009	$	3,200.00	Ciriaco	Piccirillo
Harbor - UCLA Medical Center							
209982	Aspergillus angioinvasion and dissemination	01-Jun-2005	01-Oct-2008	$	19,396.07	Donald	Sheppard
211055	Candida adherence and penetration of vascular endothelium	01-Mar-2006	05-Jun-2009	$	16,584.00	Donald	Sheppard
Los Angeles Biomedical Research Institute							
210057	Development of New Models of Invasive Aspergillosis	03-Nov-2005	14-Aug-2009	$	3,459.73	Donald	Sheppard
Multiple Sclerosis Society of Canada							

210882	Pathogenic mechanisms in an animal model of CD8+T cell-mediated demyelinating disease	01-Apr-2006	31-Mar-2010	$ 181,264.00	Sylvie	Fournier
Natural Sciences and Engineering Research Council of Canada						
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$ 41,500.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$ 25,000.00	Sylvie	Fournier
205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$ 32,200.00	Herve	Le-Moual
206249	Site-Specific Footprinting Of Protein-Nucleic Acid Complexes	01-Apr-2004	31-Mar-2010	$ 32,460.00	Matthias	Gotte
207521	Reverse Vaccinology, A Genomics Approach To Vaccine Development For A. Pleuroneumoniae	01-Apr-2004	26-Nov-2008	$ 165,500.00	James W	Coulton
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$ 48,710.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$ 20,000.00	James W	Coulton
Tibotec Pharmaceuticals Limited						
206538	Biochemical Characterization of a Novel Class of Antiretroviral Compounds	01-Jun-2004	24-Mar-2009	$ 98,350.00	Matthias	Gotte
University of Virginia						
212099	Novel tools for the study of HIV-1 rnase H inhibition	01-Aug-2006	06-Feb-2009	$ 81,000.00	Matthias	Gotte

Total for 2006-07: **$ 2,088,600.10**

Research Grants for 2007-2008

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name
American Embassy, Lima					
212574	In Vivo Efficacy and Characterization of Immune Response Associated with Oral Cochleates-Amphotericin B (CAMB) formula on Mice with Cutaneous Leishmaniasis	01-Apr-2007	31-Oct-2009	$ 74,043.48	Greg J Matlashewski
CIHR, Canadian Inst of Health Research					
206656	CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes	01-Apr-2003	31-Mar-2013	$ 132,974.00	Ciriaco Piccirillo
207818	Molecular mechanisims involved in HIV drug resistance to different classes of RT inhibitiors	01-Apr-2004	30-Jun-2009	$ 59,745.00	Matthias Gotte
209251	Mechanisms involved in nucleic acid unwinding by the HCV NTPASE/HELICASE	01-Apr-2004	22-Apr-2009	$ 41,800.00	Matthias Gotte
209448	Functional characterization of nieA, a novel Type III secredted virulence factor of enterohemorrhagic and enteropathogenic E. coli	01-Apr-2005	31-Mar-2010	$ 92,529.00	Samantha Gruenheid
209473	Molecular mechanisms of oncogenesis by sheep retrovirus envelope proteins	01-Apr-2005	31-Mar-2011	$ 101,556.00	Shan-Lu Liu
210176	Signal transduction by the salmonella enterica phoP/phoQ two component regulatory system	01-Apr-2005	31-Mar-2010	$ 69,272.00	Herve Le-Moual
212091	Developmentally dependent virulence mechanisms of the invasive mold aspergillus fumigatus	01-Apr-2006	31-Mar-2011	$ 69,452.00	Donald Sheppard
212266	Sheldon Biotechnology Centre: Surface Plasmon Resonance Facility	01-Apr-2007	31-Mar-2013	$ 79,662.00	James W Coulton
213232	Molecular mechanisms involved in HIV drug resistance to different classes of RT inhibitors	01-Apr-2007	31-Mar-2014	$ 83,135.00	Matthias Gotte
214145	CIHR/endMS Team in Immune Regulation and Biomarker Development for Pediatric and Adult Autoimmune Diseases	01-Apr-2007	31-Mar-2014	$ 45,000.00	Ciriaco Piccirillo
214825	Functional charaterization of nlaA, a novel trype III secreted virulence factor of enterhemorrhagic and enteropathogeni E. coli	01-Apr-2007	04-Aug-2008	$ 12,000.00	Samantha Gruenheid

221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$	139,277.00	Gregory T	Marczynski
224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$	116,169.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$	141,351.00	Greg J	Matlashewski
Canadian Diabetes Association							
213357	Functional impact of CD4+FOXP3+regulatory T cells in autoimmune diabetes	01-Jul-2007	30-Jun-2009	$	90,000.00	Ciriaco	Piccirillo
Canadian Foundation for Aids Research							
213524	What are the problems in the development of HIV Rnase H inhibitors?	01-Jul-2007	30-Jun-2009	$	80,000.00	Matthias	Gotte
Cancer Research Society Inc							
209507	Mechanisms involved in hepatitis C virus RNA-dependent RNA polymerase inhibition and drug resistance	01-Sep-2004	20-Jan-2009	$	60,000.00	Matthias	Gotte
Fonds de recherche sur lat nature (FQRNT)							
205918	Centre for Host Parasite Interactions	01-Apr-2003	31-Mar-2009	$	3,200.00	Greg J	Matlashewski
207773	Centre for Host-Parasite Interactions	01-Apr-2004	31-Mar-2009	$	3,200.00	Ciriaco	Piccirillo
213640	Centre de recherche en infectiologie porcine - CRIP	01-Apr-2007	31-Mar-2013	$	3,585.00	James W	Coulton
Gilead Sciences, Inc.							
213246	Excision Phenotype of Fd4Ap in Comparison with TFV and ddAMP	01-Aug-2007	01-Aug-2009	$	31,052.63	Matthias	Gotte
Harbor - UCLA Medical Center							
214186	Transcriptional Regulation of A Fumigatus Virulence	01-May-2007	31-May-2009	$	98,820.00	Donald	Sheppard
Los Angeles Biomedical Research Institute							
210057	Development of New Models of Invasive Aspergillosis	03-Nov-2005	14-Aug-2009	$	59,464.00	Donald	Sheppard
Natural Sciences and Engineering Research Council of Canada							
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$	41,500.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$	30,000.00	Sylvie	Fournier

205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$	32,200.00	Herve	Le-Moual
206249	Site-Specific Footprinting Of Protein-Nucleic Acid Complexes	01-Apr-2004	31-Mar-2010	$	32,460.00	Matthias	Gotte
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$	48,710.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	28,000.00	James W	Coulton
Orchestra Therapeutics, Inc.							
Tibotec Pharmaceuticals Limited							
206538	Biochemical Characterization of a Novel Class of Antiretroviral Compounds	01-Jun-2004	24-Mar-2009	$	-	Matthias	Gotte
University of Virginia							
212099	Novel tools for the study of HIV-1 rnase H inhibition	01-Aug-2006	06-Feb-2009	$	64,528.42	Matthias	Gotte
Virochem Pharma Inc.							
212676	Biochemical Characterization of a Novel HCV Polymerase Inhibitor	28-May-2007	31-Jul-2009	$	50,000.00	Matthias	Gotte

Total for 2007-08: **$ 2,014,685.53**

Research Grants for 2008-2009

Grant #	Grant Title	Start Date	End Date	Budget per year	FFM First and Last name	
CIHR, Canadian Inst of Health Research						
206656	CD4+CD25+ immunoregulatory T cell function in Type 1 autoimmune diabetes	01-Apr-2003	31-Mar-2013	$ 132,974.00	Ciriaco	Piccirillo
207818	Molecular mechanisims involved in HIV drug resistance to different classes of RT inhibitiors	01-Apr-2004	30-Jun-2009	$ 59,512.00	Matthias	Gotte
209448	Functional characterization of nieA, a novel Type III secredted virulence factor of enterohemorrhagic and enteropathogenic E. coli	01-Apr-2005	31-Mar-2010	$ 92,528.00	Samantha	Gruenheid
209473	Molecular mechanisms of oncogenesis by sheep retrovirus envelope proteins	01-Apr-2005	31-Mar-2011	$ 101,556.00	Shan-Lu	Liu
210176	Signal transduction by the salmonella enterica phoP/phoQ two component regulatory system	01-Apr-2005	31-Mar-2010	$ 69,272.00	Herve	Le-Moual
212091	Developmentally dependent virulence mechanisms of the invasive mold aspergillus fumigatus	01-Apr-2006	31-Mar-2011	$ 85,152.00	Donald	Sheppard
212266	Sheldon Biotechnology Centre: Surface Plasmon Resonance Facility	01-Apr-2007	31-Mar-2013	$ 79,662.00	James W	Coulton
213232	Molecular mechanisms involved in HIV drug resistance to different classes of RT inhibitors	01-Apr-2007	31-Mar-2014	$ 110,847.00	Matthias	Gotte
214145	CIHR/endMS Team in Immune Regulation and Biomarker Development for Pediatric and Adult Autoimmune Diseases	01-Apr-2007	31-Mar-2014	$ 60,000.00	Ciriaco	Piccirillo
215360	Immunomodulation of regulatory mechanisms in mucosal immunity: A multi disciplinary bench to bedside approach to the study and treatment	01-Apr-2007	31-Mar-2012	$ 159,705.48	Ciriaco	Piccirillo
216369	Development of a new generation of live vaccines using Lactococcus lactis	01-Apr-2008	31-Mar-2013	$ 86,470.00	Benoit	Cousineau
216374	Genetic dissection of the host response to intestinal infections	01-Apr-2008	31-Mar-2015	$ 71,392.00	Samantha	Gruenheid
216817	Defining immunological checkpoints to enhance cancer immunotherapy	01-Apr-2008	31-Mar-2012	$ 40,000.00	Ciriaco	Piccirillo
217057	Mechanism of inhibition of HIV-1 RT through delayed chain-termination	01-Apr-2008	31-Mar-2013	$ 34,155.00	Matthias	Gotte
221530	Developmental And Cell-Cycle Control Of Chromosome Replication	01-Apr-1995	31-Mar-2011	$ 139,277.00	Gregory T	Marczynski

224766	Structural Biology Of Bacterial Membrane Proteins	01-Apr-1997	31-Mar-2014	$ 186,625.00	James W	Coulton
229829	Molecular Characterisation Of Leishmania Infection	01-Apr-1995	31-Mar-2013	$ 141,351.00	Greg J	Matlashewski
Canadian Diabetes Association						
213357	Functional impact of CD4+FOXP3+regulatory T cells in autoimmune diabetes	01-Jul-2007	30-Jun-2009	$ 90,000.00	Ciriaco	Piccirillo
Canadian Foundation for Aids Research						
213524	What are the problems in the development of HIV Rnase H inhibitors?	01-Jul-2007	30-Jun-2009	$ 80,000.00	Matthias	Gotte
Cancer Research Society Inc						
217241	Interaction between the polymerase of the hepatitis C virus and different classes of inhibitors	01-Sep-2008	31-Aug-2010	$ 60,000.00	Matthias	Gotte
Fonds de recherche sur lat nature (FQRNT)						
213640	Centre de recherche en infectiologie porcine - CRIP	01-Apr-2007	31-Mar-2013	$ 4,000.00	James W	Coulton
Gilead Sciences, Inc.						
213246	Excision Phenotype of Fd4Ap in Comparison with TFV and ddAMP	01-Aug-2007	01-Aug-2009	$ 33,529.41	Matthias	Gotte
Harbor - UCLA Medical Center						
211055	Candida adherence and penetration of vascular endothelium	01-Mar-2006	05-Jun-2009	$ 12,892.58	Donald	Sheppard
214186	Transcriptional Regulation of A Fumigatus Virulence	01-May-2007	31-May-2009	$ 52,113.00	Donald	Sheppard
Los Angeles Biomedical Research Institute						
210057	Development of New Models of Invasive Aspergillosis	03-Nov-2005	14-Aug-2009	$ 29,732.00	Donald	Sheppard
Merck & Co. Inc						
216361	Understanding & Exploiting the Mechanism of Raltegravir	21-Aug-2008	30-Sep-2009	$ 60,200.00	Matthias	Gotte
Multiple Sclerosis Society of Canada						
210882	Pathogenic mechanisms in an animal model of CD8+T cell-mediated demyelinating disease	01-Apr-2006	31-Mar-2010	$ 91,382.00	Sylvie	Fournier
National Canadian Research Training in Hepatitis C						
212895	Excusion of Nucleoside analysis by the Hepatitis C RNA dependent	01-Jul-2007	31-Jul-2009	$ 23,300.00	Matthias	Gotte

	RNA pol.						
Natural Sciences and Engineering Research Council of Canada							
202406	Evolution Of Mobile Group II Introns	01-Apr-2000	31-Mar-2014	$	42,500.00	Benoit	Cousineau
203427	Role Of B7.2 Costimulation In T Cell Homeostasis	01-Apr-1999	31-Mar-2012	$	30,000.00	Sylvie	Fournier
205103	Signal Transductin By Bacterial Ser/Thr Kinases	01-Apr-2003	31-Mar-2014	$	25,000.00	Herve	Le-Moual
206249	Site-Specific Footprinting Of Protein-Nucleic Acid Complexes	01-Apr-2004	31-Mar-2010	$	32,460.00	Matthias	Gotte
223349	Function Of The Alternatively Spliced P53 Gene	01-Apr-1999	31-Mar-2015	$	48,710.00	Greg J	Matlashewski
224561	Cbl Interface For Vitamin B12 Metabolism	01-Apr-1997	31-Mar-2013	$	28,000.00	James W	Coulton
Tibotec Pharmaceuticals Limited							
216337	Biochemical Characterization of a Novel Class of Antiviral Compounds with Activity Against HCV NS5B Polymerase and/or HIV RT	15-Sep-2008	14-Sep-2009	$	98,350.00	Matthias	Gotte
University of Virginia							
212099	Novel tools for the study of HIV-1 rnase H inhibition	01-Aug-2006	06-Feb-2009	$	929.82	Matthias	Gotte
Gates Foundation							
217873	Development of molecula diagnostics for visceral lieshmaniasis	01-Jan-2009	31-Dec-2010	$	60,000.00	Greg	Matlashewski
		Total for 2008-09:		**$**	**2,553,577.29**		