# Microbiology and Immunology

McGill University

# UNDERGRADUATE HANDBOOK

## 2012 - 2013

## WELCOME TO THE DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY!

**www.mcgill.ca/undergrad.microimm@mcgill.ca**

This handbook is designed to provide you with information about undergraduate courses and programs offered in the Department of Microbiology and Immunology at McGill University. The Department offers three programs of study: the Faculty program, the Major program, and the Honours program.

The Administrative Offices are located on the 5th floor of the Duff Medical Building on University Street. Full-time faculty members have laboratories at this location, while associated staff are in nearby research institutes and teaching hospitals.

You are welcome to come and talk to our faculty members and to meet other students. We are here to help you and hope you will enjoy and be enriched by the courses you may take with us.

For specific enquiries, please contact the Student Affairs Officer,
Room 511,
3775 University Street,
Montreal, Quebec, H3A 2B4
Telephone: (514) 398-3915
**Undergrad.microimm@mcgill.ca**

## BIENVENUE AU DÉPARTEMENT DE MICROBIOLOGIE ET IMMUNOLOGIE!

**www.mcgill.ca/undergrad.microimm@mcgill.ca**

Ce guide vous renseignera sur les cours et programmes de premier cycle offerts par le Département de Microbiologie et Immunologie de l'Université McGill. Le Département offre trois programmes d'études: le programme "Faculty", le programme "Major" et le programme "Honours".

Les services administratifs sont situés au 5$^{e}$ étage du Pavillon Duff Médicale, rue University. Les membres du corps enseignant à plein temps ont leur laboratoire dans ce pavillon et les membres associés travaillent dans les instituts de recherche et hôpitaux affiliés.

Vous êtes invité(e)s à venir rencontrer les professeurs et les étudiants du Département. Nous sommes là pour vous aider et nous croyons que les cours que vous suivrez sauront vous intéresser et approfondir vos connaissances.

Pour plus de renseignements, veuillez vous adresser à l'agent des affaires étudiantes,
bureau 511,
3775, rue University,
Montréal (Québec) H3A 2B4
no. de téléphone: (514) 398-3915
**Undergrad.mciroimm@mcgill.ca**

# MICROBIOLOGY AND IMMUNOLOGY

# UNDERGRADUATE HANDBOOK

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# 1. SCOPE OF MICROBIOLOGY AND IMMUNOLOGY

Microbiology is the study of the microorganisms such as bacteria, viruses, unicellular eukaryotes and parasites. Microorganisms play an important role in human and animal disease, food production (bread, cheese, wine), decay and spoilage, contamination and purification of water and soil, production and the recycling of food in lakes and oceans. Microbiologists study these tiny, self-replicating machines in an attempt to understand the basic principles of life: growth, metabolism, cell division, control of gene expression, response to environmental stimuli. Microbiologists are also concerned with controlling or harnessing microorganisms for the benefit of people, by isolating antibiotics or producing vaccines to protect against disease and by developing and perfecting microorganisms for industrial uses.

Immunology is the study of the molecular and cellular basis of host resistance and immunity to external agents such as pathogenic microorganisms. Immunologists attempt to understand the mechanisms by which the body recognizes foreign antigens, generates appropriate antibodies to an enormously diverse spectrum of antigens, and sequesters and kills invading microorganisms. Their discoveries lead to better understanding of vaccination against disease, transfusions and organ transplants, allergies, cancer, autoimmune diseases and immune-deficiency diseases such as AIDS. Immunologists have developed monoclonal antibodies as highly specific tools in diagnosis and treatment of disease. Antibodies may soon be used in conjunction with antibiotics or chemical agents as specific "silver bullets" to attack microbes and cancers.

The disciplines of microbiology and immunology are natural partners in research, and both fields use the modern methods of cell biology, molecular biology and genetics to study basic life processes. The Department of Microbiology and Immunology includes scientists who study microbial physiology and genetics, microbial pathogenesis, molecular virology, cellular and molecular immunology, and parasitology. Students registered in the Department therefore are exposed to these related areas and receive an excellent background in basic biology and chemistry as well as in the more applied areas of biotechnology and medicine.

Many opportunities exist for careers in basic or applied microbiology and immunology, medical microbiology, environmental microbiology, and biotechnology. They include positions in industry (pharmaceutical and biotechnology), hospitals, universities, and government agencies (environment, public health, and energy). A degree in microbiology also provides an excellent basis for entering professional and postgraduate programs in medicine, dentistry, the veterinary sciences, research, and education.

For further information, consult the "Career Opportunities" section in this handbook.

# 2. INTRODUCTION

## HISTORY OF THE DEPARTMENT OF MICROBIOLOGY AND IMMUNOLOGY

Sixty years ago, efforts began to consolidate teaching and research in microbiology within the faculties of Medicine and Science. As a result, a new Department of Bacteriology was founded with Dr. E.G.D. Murray as its first Chairman. Dr. Murray arrived from Cambridge to find that he was the sole staff member of a department whose few laboratories were not designed for bacteriological work. With energy and determination, Murray undertook to create a new department for teaching medical students as well as undergraduate and graduate students in the science of microbial organisms and disease pathogenesis.

Murray's work set the stage for today's extensive network of collaboration with key research institutions, including the Biotechnology Research Institute of the National Research Council, Lady Davis Institute, Institut Armand-Frappier and l'Institut de Recherches Cliniques de Montréal. The Department also has close ties with McGill's teaching hospitals: the Royal Victoria Hospital, the Montreal Children's Hospital, the Jewish General Hospital, the Montreal General Hospital, the Shriners' Hospital for Crippled Children and the Montreal Neurological Institute.

In 1965, the Department's name was changed to Microbiology and Immunology to reflect more accurately its greater scope of research and teaching activities. Additional space enlarged the Department to its present 37,000 square feet, which includes 18 laboratories and service units. Under the direction and guidance of a succession of dedicated Chairmen in the years that followed Professor Murray's exceptional 25 year tenure, the Department expanded to its present complement of professors and support staff which numbers more than 40.

## THE DEPARTMENT TODAY

The Department of Microbiology and Immunology concentrates on four key areas of research: cellular and molecular immunology, microbial physiology and genetics, molecular biology of viruses, and medical microbiology. There are research laboratory facilities for fourteen full-time staff members in the Duff Medical Building. Affiliated staff are in nearby research institutes or teaching hospitals.

The Department currently occupies four floors in the Duff Medical Building and includes research laboratories, major equipment rooms including flow cytometry and phosphorimager suites, media and glassware facilities, animal care facility, seminar rooms and an administrative office. The Sheldon Biotechnology Centre, located in a building contiguous to ours, provides the sophisticated services of oligonucleotide and peptide synthesis, protein and DNA sequencing, and computer-aided analysis of macromolecular structures.

## 3. COUNSELLING SERVICES

Some of the sources of information and help available to you include:

### SERVICE POINT

Service Point offers a variety of administrative services for both undergraduate and graduate students. The Service Point Office is located at **3415 McTavish Street** (corner of Sherbrooke). Regular office hours are 9:30 a.m. to 5:00 p.m. Telephone 514-398-7878 or visit their website at www.mcgill.ca/students/servicepoint/ for more information. You should contact Service Point for all Student Record and Registration matters, which include:

- Help with MINERVA
- Approval and processing of course changes past record deadlines
- Approval and processing of transfer credits and exemptions
- Approval and processing of requests for special final, deferred, and supplemental exams as well as J appeals
- Approval and processing of marks and mark changes for courses administered by Arts and Science
- Student ID cards
- International health insurance
- Student Exchange office
- Exam office
- Official transcript pick-up (Request must be made online via MINERVA)
- Submitting legal documents
- Tuition and Fees information

### FACULTY OF SCIENCE/SOUSA

The office of the Faculty of Science and the Science Office for Undergraduate Student Advising and can provide general and specific information about undergraduate science programs. Both are located in Dawson Hall, room 405 for SOUSA services. Telephone 514-398-5442 or visit their website at www.mcgill.ca/science/sousa. SOUSA can be contacted for academic advising, outreach, and academic follow-up of records decisions. Their services include:

- Academic Advising including monitoring completion of freshman programs and other general academic issues
- Outreach for students via email about academic issues
- Approval of requests for 600 level courses
- Approval of study away applications, courses, credits, in conjunction with departments
- Faculty approval of exchange applicants
- Graduation approval
- Degree certification
- Advising and orientation of new instructors

## STUDENT SERVICES

The Office of the Dean of Students is responsible for the coordination of all Student Services including Counselling and Tutorial Services, Health, Mental Health, Career and Planning Service (CaPS), Office for Students with Disabilities, Student Aid/International Student Advisor. The Office is located at 3600 McTavish Street, Suite 4100. Office hours are 9:00 a.m. to 5:00 p.m., telephone 514-398-3825 or visit http://www.mcgill.ca/studentservices for general information.

## FACULTY OF ARTS AND SCIENCE CALENDAR

The regulations and other important details on choosing courses are available online at: www.mcgill.ca/students/courses/calendars

## MICROBIOLOGY & IMMUNOLOGY UNDERGRADUATE HANDBOOK

The handbook which you are now reading supplements the calendar with more specific information on programs and courses in the Department. The required courses that are listed in this handbook take precedence over errors that may occur in the calendar. On line information can be found at: http://www.mcgill.ca/microimm/undergraduate/

## DEPARTMENTAL NOTICE BOARD

The Departmental Notice Board provides current information concerning courses and programs and is located on the fifth floor of the Duff Medical Building. Important information on available scholarships and awards is posted throughout the year.

## STUDENT AFFAIRS OFFICER

The Office of the Student Affairs Officer is located in Room 511 of the Duff Medical Building. If you wish to enquire about or discuss any aspect of the undergraduate courses or programs offered by the Department of Microbiology & Immunology, you may contact Jennifer DiMassimo, the Student Affairs Officer by calling 514-398-3915 to make an appointment.

## ACADEMIC ADVISORS

Students are assigned an academic advisor when they first register in the Department of Microbiology and Immunology. There is a Chief Advisor, plus three academic advisors for each year. Students should consult their assigned advisor for program and career planning. These advisors rotate each year so that they follow the student through the three-year program. Commencing 2012-2013, the advisors are:

| **CHIEF ADVISOR** | **Dr. Benoit Cousineau** | **398-8929, Room 617** |
|---|---|---|
| U1 ADVISOR letters A to G | Dr. M. Gotte ***(on sabbatical)*** | 398-1365, Room D6 5th fl |
| U1 ADVISOR letters H to M | Dr. R. Murgita | 398-3927, Room 408 |
| U1 ADVISOR letters N to Z | Dr. S. Vidal | 398-2362, Room 367 |
| U2 ADVISOR letters A to G | Dr. S. Gruenheid | 398-2138, Room 365 Bellini bldg. |
| U2 ADVISOR letters H to M | Dr. J. Coulton | 398-3929, Room 403 |
| U2 ADVISOR letters N to Z | Dr. H. Le Moual | 398-6235, Room 503 |
| U3 ADVISOR letters A to G | Dr. G. Matlashewski | 398-7479/6071, Room D17 5th fl |
| U3 ADVISOR letters H to M | Dr. S. Fournier | 398-7273, Room 603 |
| U3 ADVISOR letters N to Z | Dr. G. Marczynski | 398-3917, Room 506 |

## MICROBIOLOGY AND IMMUNOLOGY STUDENTS' ASSOCIATION (MISA)

All students registered in Microbiology and Immunology are members of the Microbiology and Immunology Students' Association (MISA). Officers are elected yearly in the spring. MISA sponsors various events throughout the year and represents the Undergraduates at the Departmental level. The MISA office is located in Room D-10 of the Duff Medical Building (e-mail: misa@sus.mcgill.ca).

# 4. THE FACULTY AND THEIR RESEARCH STAFF LOCATED IN THE DUFF MEDICAL BUILDING

## FACULTY ROOM NUMBERS, TELEPHONE NUMBERS, E-MAIL ADDRESSES AND RESEARCH AREA

The following members are based in the same building as the Departmental Administrative Office.

Address: Department of Microbiology & Immunology
McGill University
3775 University Street
Mtl., QC H3A 2B4 FAX: (514) 398-7052

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**Briedis, Dalius J.** - Room 502, Tel: 514-398-3925
E-mail: ***dalius.briedis@mcgill.ca***
Research: Molecular biology and pathogenesis of measles virus infection

**Coulton, James W.** - Room 403, Tel: 514-398-3929
E-mail: ***james.coulton@mcgill.ca***
Research: Microbial Physiology / Genetics - Molecular Biology of membrane proteins

**Cousineau, Benoit** - Room 617, Tel: 514-398-8929
E-mail: ***benoit.cousineau@mcgill.ca***
Research: Molecular biology / Microbiology / Evolution / Genetics
Mechanisms and applications of group II intron mobility
Evolution of mobile group II introns

**Fournier, Sylvie** – Room 600, Tel: 514-398-7273
E-mail: ***sylvie.fournier@mcgill.ca***
Research: Cellular Immunology

**Götte, Matthias** – Room D6, Tel: 514-398-1365
E-mail: ***matthias.gotte@mcgill.ca***
Research: HIV plus-strand DNA synthesis and primer removal

**King, Irah** - Room 406
E-mail: **irah.king@mcgill.ca**

**Krawczyk, Connie** – Room 608, Tel: 514-398-1376
E-mail: ***connie.krawczyk@mcgill.ca***
Research: Immunology

**Lee, Byong** – Room 508, Tel: 514-398-2835
E-mail: ***byong.lee@mcgill.ca***
Research: Designed probiotics in health ad disease, foreign gene overexpression

**Le Moual, Hervé** - Room 503, Tel: 514-398-6235
E-mail: ***herve.le-moual@mcgill.ca***
Research: Molecular Microbiology

**Madrenas, Joaquin – Chair, Dept. of Microbiology and Immunology**
Office room 511/Lab room 613, Tel: 514-398-3914
E-mail: ***joaquin.madrenas@mcgill.ca***
Research: Nephrology/Immunology
Regulation of T cell activation through the TCR; development of immunotherapies

**Marczynski, Gregory** T. - Room 506, Tel: 514-398-3917
E-mail: ***gregory.marczynski@mcgill.ca***
Research: Microbial Physiology / Genetics
Cell cycle and developmental control of chromosomal replication

**Matlashewski, Greg** - Room D17, Tel: 514-398-3914
E-mail: ***greg.matlashewski@mcgill.ca***
Research: Virology / Parasitology
Human papillomavirus and cervical cancer; Human Leishmania infection

**Murgita, Robert A.** - Room 408, Tel: 514-398-3927
E-mail: ***robert.murgita@mcgill.ca***
Research: Immunology

**Olivier, Martin** - Room 610. Tel: 514-398-5592
E-mail: ***martin.olivier@mcgill.ca***
Research: Immune evasion by parasites; ***Leishmania*** topoisomerase and apoptosis

**Sheppard, Don** – Room D22, Tel: 514-398-1759
E-mail: ***donald.sheppard@mcgill.ca***
Research: Molecular Mycology

**FACULTY BASED IN VARIOUS HOSPITALS AND RESEARCH INSTITUTES:**

**Antel, Jack** - Department of Neurology and Neurosurgery, Montreal Neurological Institute, Room 111, 3801 University Street, Montreal, QC H3A 2B4
Tel: 514-398-8531, Fax: 514-398-7371
E-mail: ***jack.antel@.mcgill.ca***
Research: Neurology. Immune regulation and brain-immune interactions. Autoimmunity and multiple sclerosis

**Archambault, Jacques** – Laboratory of Molecular Virology, Institute de Recherches Cliniques de Montréal (IRCM), 110 Pine Ave West, Montreal QC H2W 1R7
Tel: 514-987-5739, Fax: 514-987-5741
E-mail: jacques.archambault@ircm.qc.ca or jacques.archambault@mcgill.ca
Research: Molecular Biology and Pathogenesis of Human Papillomaviruses (HPV)

**Bar-Or, Amit** - Neuroimmunology Unit, Montreal Neurological Institute, Room 111, 3801 University Street, Montreal, QC H3A 2B4
Tel: 514-398-5132, Fax: 514-398-7371
E-mail: ***amit.bar-or@staff.mcgill.ca***
Research: Memory B cells and T cells. Co-stimulations. Autoimmune Diseases. Multiple Sclerosis (MS).

**Behr, Marcel** - Division of Infectious Diseases, Department of Medicine, Montreal General Hospital, Room A5-156, 1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514-934-1934, ext. 42815, Fax: 514-934-8016
E-mail: ***marcel.behr@mcgill.ca***
Research: Molecular Epidemiology of Infectious Diseases.

**Berghuis, Albert** - Canada Research Chair in Structural Biology. Departments of Biochemistry and Microbiology & Immunology, Bellini Bldg., Room 466,
Tel: 514-398-8795, Fax: 514-398-2983
E-mail: ***albert.berghuis@mcgill.ca***
Research: Structural biology, biochemistry, structure-based drug design

**Burnier, Miguel** - Chair, Department of Ophthalmology, Royal Victoria Hospital, 687 Pine Avenue West, Montreal, QC H3A 1A1
Tel: 514-934-1934 x.31544/35302, Fax: 514-843-1624
E-mail: miguel.burnier@mcgill.ca

**Cermakian, Nicolas** - Associate Professor, Department of Psychiatry, McGill University, Director, Laboratory of Molecular Chronobiology, Douglas Institute, Researcher, Perry Pavilion, Rm E-2108, 6875 boul. LaSalle, Montreal QC H4H 1R3
Tel: 514-761-6131 ext.: 4936, Fax: 514-762-3034
E-mail: **nicolas.cermakian@mcgill.ca**
Research: Circadian rhythms, clock genes, sleep regulation

**Christou, Nicolas** - Department of Surgery, RVH, 687 Pine Avenue West, Montreal, QC, H3A 1A1
Tel: 514-934-1934, ext. 31531, Fax: 514-843-1503
E-mail: ***nicolas.christou@muhc.mcgill.ca***
Research: Polymorphonuclear Neutrophil-Endothelial Interactions in Sepsis.

**Dascal, André** - Department of Microbiology, Div. of Infectious Diseases, Jewish General Hospital, 3755 Côte-Ste-Catherine Road, Montreal, QC H3T 1E2
Tel: 514-340-8294, Fax: 514-340-7508
E-mail: ***adasca@po-box.mcgill.ca***
Research: Medical Microbiology; Rapid viral and bacterial identification, antimicrobial susceptibility testing, cost effective diagnostic microbiology

**Descoteaux, Albert** - Institut Armand-Frappier,
531, boulevard des Prairies, Laval, QC H7V 1B7
Tel: 450-687-5010, ext. 4465, Fax: 450-686-5501
E-mail: ***albert.descoteaux@iaf.inrs.ca***
Research: Immunology and Parasitology
Macrophage activation; Leishmania-macrophage interaction

**Divangahi, Maziar** - Assistant Professor, Dept Medicine, Assoc Member, Dept Microbiology and Immunology, McGill University, Meakins-Christie Laboratories, McGill University, 3626 St. Urbain Street, Montreal QC H2X 2P2
Tel: 514-398-3864 Ext. 089727, Fax: 514-398-7483
E-mail: **maziar.divangahi@mcgill.ca**

**Finzi, Andrés** - Adjunct Professor, Department of Microbiology and Immunology,
Director - Laboratory of Retroviral Entry – Centre de Recherche du CHUM, Université de Montréal, 264 René-Lévesque Blvd. East, Édouard-Asselin, Room 303
Montréal, QC, H2X 1P1
Tel: 514-980-8000 #35264 Fax: 514-412-7377
E-mail: **andres.finzi@umontreal.ca** at CRCHUM
Research: Structural and Functional Biology of Retroviral Entry

**Fritz, Jörg** – Complex Traits Group, McGill Life Sciences Complex, Bellini Pavilion, Room 324, 3649 Promenade Sir-William Osler, Mtl, QC H3G 0B1
Tel: 514-398-1707/6417, Fax: 514-398-2603
E-mail: ***jorg.fritz@mcgill.ca***
Research: Regulation of innate host resistance on inflammatory and antigen-specific adaptive immune responses

**Gatignol, Anne** - Molecular Oncology Group / McGill AIDS Centre, Lady Davis Institute, Jewish General Hospital, Room 502, 3755 Cote-Ste-Catherine Road, Mtl, QC H3T 1E2
Tel: 514-340-8260, ext. 5284, Fax: 514-340-7576
E-mail: ***anne.gatignol@mcgill.ca***
Research: Molecular Biology and Virology

**Gruenheid, Samantha** – Room 365, Bellini Bldg., Tel: 514-398-2138, Fax: 514-398-2603
E-mail: ***samantha.gruenheid@mcgill.ca***
Research: Bacterial pathogens. Host pathogen interactions.

**Hussain, Sabah** - Critical Care Division, Dept. of Medicine, Royal Victoria Hospital, Room L3.05, 687 Pine Avenue West, Montreal, QC H3A 1A1
Tel: 514-934-1934, ext. 34645, Fax: 514-843-1686
E-mail: ***sabah.hussain@muhc.mcgill.ca***
Research: Molecular Biology / Biochemistry / Cell Physiology
Nitric Oxide / Reactive Oxygen Species Biology

**Jardim**, Armando - Institute of Parasitology, McGill University, Macdonald Campus, 21,111 Lakeshore Road, Ste-Anne-de-Bellevue, QC H9X 3V9
Tel: 514-398-7727, Fax: 514-398-7857
E-mail: ***armando.jardim@mcgill.ca***
Research: Molecular Parasitology / Cell Biology

**Koromilas, Antonis** - Molecular Oncology Group, Lady Davis Institute, Jewish General Hospital, Room 508, 3755 Côte-Ste-Catherine Road, Montreal, QC H3T 1E2
Tel: 514-340-8260, ext. 3697, Fax: 514-340-7576
E-mail: ***antonis.koromilas@mcgill.ca***
Research: Cytokine Signalling, Tumor Suppressor Genes and Viral Oncogenesis

**Kristof, Arnold** - Critical Care Division, Room L3.02, Royal Victoria Hospital, 687 Pine Avenue West, Mtl., QC H3A 1A1
Tel: 514-843-1664, Fax: 514-843-1686
E-Mail: ***arnold.kristof@muhc.mcgill.ca***
Research: Nitric Oxide, Innate immunity, Pneumonia, Lung epithelial cells, Transcription Factors, Cell Signaling

**Lau, Peter** - Environmental Genetics, National Research Council of Canada, 6100 Royalmount Avenue, Montreal, QC H4P 2R2
Tel: 514-496-6325, Fax: 514-496-6265
E-mail: ***peter.lau@nrc.ca***
Research: Environmental Biotechnology
Molecular Genetics of Biodegradation and Gene Technology

**Liang, Chen** – McGill Aids Centre, Lady Davis Institute, Jewish General Hospital, Room 326, 3755 Côte-Sainte-Catherine Rd., Mtl., QC H3T 1E2
Tel: 514-340-8260, ext. 4826, Fax: 514-340-7537
E-mail: ***chen.liang@mcgill.ca***
Research: Viral and cellular factors involved in HIV-1 assembly.

**Lin, Rongtuan** - Associate Professor, Department of Medicine, Division of Experimental Medicine
Tel: 514-340-8222, ext. 5272
E-mail: **rongtuan.lin@mcgill.ca**

**Loo, Vivian** - Infectious Diseases and Microbiology Chief, Dept. of Microbiology, R.V.H., Room L5.06, 687 Pine Ave., W., Montreal, QC H3A 1A1
Tel: 514-934-1934, ext. 42818, Fax: 514-934-8016
E-mail: ***vivian.loo@muhc.mcgill.ca***
Research: Medical Microbiology

**Manges, Amee** – Department of Epidemiology, Biostatistics and Occupational Health, Purvis Hall, Room 36B, 1020 Pine Avenue W., Mtl., QC H3A 1A2
Tel: 514-598-3267, Fax: 514-398-4503
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**Matte, Allan** - Biotechnology Research Institute
6100 Royalmount Ave., Montreal, QC H4P 2R2
Tel: 514-496-2557, Fax: 514-496-5143
E-mail: ***allan.matte@nrc-cnrc.gc.ca***

**Miller, Mark** - Division of Infectious Diseases, Jewish General Hospital,
Room G-140, 3755 Côte-Ste-CatherineRoad, Montreal, QC H3T 1E2
Tel: 514-340-8294, Fax: 514-340-7546
E-mail: ***mmiller@lab.jgh.mcgill.ca***
Research: Infectious Diseases

**Mouland, Andrew** - McGill AIDS Centre, Lady Davis Institute, Jewish General Hospital,
Room 323A, 3755 Côte-Ste-Catherine Road, Montreal, QC H3T 1E2
Tel : 514-340-8260, ext. 4847, Fax : 514-340-7576
E-mail : ***amouland@microimm.mcgill.ca***
Research: Retrovirology (HIV-1), Molecular Biology and Virology, Virus-host interactions, Viral RNA metabolism and transport, Viral Assembly.

**Ndao, Momar** - National Reference Laboratory for Parasitology,
Montreal General Hospital, Research Unit, Room R3-137,
1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514- 934-1934, ext. 44536/44537, Fax: 514- 934-8347
E-mail: ***momar.ndao@mcgill.ca***
Research: Parasitology/Immunology

**Newkirk, Marianna** - Department of Rheumatology, Montreal General Hospital,
Room A6-148, 1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514-934-1934, ext. 44075, Fax: 514-934-8239
E-mail: ***marianna.newkirk@mcgill.ca***
Research: Immunology, Etiology of autoimmune rheumatic diseases: Role of antigen, antibody and anti-inflammatory proteins

**Nguyen, Dao** - Assistant Professor, Department of Medicine, Montreal General Hospital Research Institute,1650 Cedar ave, room L11.513, Montreal, QC, H3G 1A4
Tel: 514-934-1934 ext 42534, fax: 514-934-8226
**E-mail:** **dao.nguyen@mcgill.ca**
Research: Molecular microbiology of biofilms and Pseudomonas aeruginosa infections.

**Pantopoulos, Kostas** - Lady Davis Institute, Jewish General Hospital,
3755 Cote-Ste-Catherine Road, Montreal, QC H3T 1E2
Tel : 514-340-8260, ext. 5293, Fax: 514-340-7502
E-mail : ***kostas.pantopoulos@mcgill.ca***
Research: Molecular Biology / Iron Metabolism

**Piccirillo, Ciriaco** – Montreal General Hospital, Room L11.132-144,
1650 Cedar Avenue, Montreal QC H3G 1A4
Tel: 514-934-1934 ext: 45135
E-mail: ***ciro.piccirillo@mcgill.ca***
Research: Immunoregulation of autoimmune and infectious diseases.

**Rauch, Joyce** - Division of Rheumatology, Montreal General Hospital,
Room A6-148, 1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514-934-1934, ext. 42149, Fax: 514-934-8261
E-mail: ***joyce.rauch@mcgill.ca***
Research: Immunochemical reactivities and induction of autoantibodies,
autoimmunity and system lupus erythematosus

**Reed, Michael** – Molecular Pathogenesis of Tuberculosis
Medicine, Infectious Diseases, Montreal General Hospital, 1625 Pine Avenue West Montreal, QC
Tel: 514-934-1934 ext: 43543

**Ribeiro, Paula** - Institute of Parasitology, McGill University, Macdonald Campus,
21,111 Lakeshore Road, Ste-Anne-de-Bellevue, QC H9X 3V9
Tel: 514-398-7607, Fax: 514-398-7857
E-mail: ***paula.ribeiro@mcgill.ca***
Research: Molecular Parasitology; G Protein-Coupled Receptors; Signal Transduction

**Saleh, Maya** – Bellini Bldg., Room 3810, Lab # 398-2140
Tel: 514-398-2065
E-mail: ***maya.saleh@muhc.mcgill.ca***
Apoptosis, inflammation and host response to infections.

**Suh, Woong-Kyung** – Adjunct Professor, Immune Regulation Laboratory
Institut de Recherche Cliniques de Montreal (IRCM)
110 des Pins Ouest, Montreal QC H2W 1R7
Tel : 514-987-5720 Fax : 514-987-5768
E-mail: **woong-kyung.suh@ircm.qc.ca**

**Teodoro, Jose** - Assistant Professor, Department of Biochemistry, Rosalind and Morris Goodman Cancer Center and Department of Biochemistry, The Cancer Research Building, 1160 Pine Avenue
Office: Room 616; Lab: Room 607, Montreal, Quebec H3A 1A4
Tel: 514-398-3273; Lab: 514-398-8934, Fax: 514-398-6769
E-mail: **jose.teodoro@mcgill.ca**
Research: Tumour Angiogenesis and Apoptosis

**Tsoukas, Christos** - Immune Deficiency Treatment Centre – IDTC, Montreal General Hospital,
Room A5-140, 1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514-934-8035, Fax: 514-937-1424
E-mail: ***chris.tsoukas@muhc.mcgill.ca***

**Turcotte, Bernard** - Molecular Endocrinology, Department of Medicine, Royal Victoria Hospital, Room H5-74, 687 Pine Avenue West, Montreal, QC H3A 1A1
Tel: 514-934-1934, ext. 35842, Fax: 514-982-2819
E-mail: ***bernard.turcotte@mcgill.ca***
Research: Functional Genomics
Chromatin Structure and Regulation of Gene Expression in Eukaryotes.

**Vidal, Silvia** - Room 367, Bellini Bldg., Tel: 514-398-2362, Fax: 514-398-2603
E-mail: ***silvia.vidal@mcgill.ca***
Research: Genetics of host resistance

**Wainberg, Mark** - McGill AIDS Centre, Lady Davis Institute, Jewish General Hospital, Room 328A, 3755 Côte-Ste-Catherine Road, Montreal, QC H3T 1E2
Tel: 514-340-8260, ext. 5282, Fax: 514-340-7502
E-mail: ***mark.wainberg@mcgill.ca***
Research: Molecular Biology / Virology; HIV reverse transcriptase; molecular basis for drug resistance; gene therapy.

**Ward, Brian** - Department of Microbiology, Tropical Medicine, Montreal General Hospital, Office Room: L10-309.1, Lab Room: R3.133, 1650 Cedar Avenue, Montreal, QC H3G 1A4
Tel: 514-934-1934, ext. 42810 or 44585, Fax: 514-933-7146
E-mail: ***brian.ward@mcgill.ca***
Research: Vaccine Immunology; Immunology and immunopathology of vaccines; Nutrition, Immunity and Infectious Diseases.

**Zhang, Ji** - Faculty of Dentistry, Room M-51, Strathcona Anatomy and Dentistry, 3640 University Street, Montreal, QC H3A 2B2
E-mail: **ji.zhang@mcgill.ca**

# 5. ADMISSION/REGISTRATION

## UNDERGRADUATE STUDIES
### REGISTRATION: GENERAL INFORMATION

**Students will register via Minerva. Check the following site for registration dates at: http://www.mcgill.ca/student-records/dates/registration/**

**ADMISSION ELIGIBILITY:**
U0 applicants
- Students applicants with a U0 GPA of 3.30 will be admitted in June.
- Students with a U0 GPA 3.00-3.29 will be placed on a waiting list for admission in August depending on the availability of space in the program.

U1 applicants
- Students with a CEGEP Cote R of 28-30 will be admitted in August.

U2 transfers:
- Students transferring from other programs or universities require a CGPA of 3.30 and approval of the Microbiology Chief Advisor.

**Returning students** (including students transferring from other departments) - **U0's** going to U1; **U1's** going to U-2; and **U2's** going to U3 MUST attend an advising session held the first two weeks of April (no appointment necessary).

**Freshman students (U0's) and Transfer students MUST APPLY TO THE DEPT BY THE 15TH OF MAY.** Enrolment to the department is limited to a total of 120 students per year. Students transferring from BBL (Biological, Biomedical & Life Sciences) may be admitted with a B+ average (3.3 CGPA) up to the maximum program capacity of 120 students. Students will be notified by e-mail. Applicants not admitted will be placed on a waiting list and will be considered should vacancies occur.

Application forms are available in the Duff Bldg., Room: 511 or on the department website, www.mcgill.ca/microimm. All students completing a Freshman program **(U-0)** or students transferring from another program at McGill must attend one of the scheduled advising sessions held the first week of April (no appointments necessary – dates will be posted on our website, www.mcgill.ca/microimm).

**New students from Cegep** can register in June via Minerva. Students must attend an advising session held the last week of August. **Students may register for courses before advising** (no appointment necessary).

**DESIGNATION U0, U1, U1, U3:**
- first year of study by four-year students (120 credits) is: U0
- second year of study is: U1
- third year of study is: U2
- fourth year of is: U3

**Quebec students who enter from CEGEP begin their studies in the U1 year and progress to U2 and U3 (90 credits).**

# ORIENTATION FOR NEW STUDENTS

**Orientation for Microbiology & Immunology students will be held in the last week of August.**

**ATTENDANCE IS STRONGLY RECOMMENDED.**

**5A. PROCEDURES**

# UNDERGRADUATE STUDENTS

**PLEASE BE ADVISED OF THE FOLLOWING PROCEDURES:**

## EXAM VIEWING

## DATES WILL BE ASSIGNED FOR STUDENTS TO REVIEW EXAM

***Students intending to apply for a REREAD must not remove exams or term papers from the department.***

## ADVISING

**D**ROP OFF THE MINERVA COURSE SELECTION FORM *(AFTER YOUR ACADEMIC ADVISOR HAS SIGNED IT)* IN THE BOX JUST OUTSIDE ROOM 511, DUFF MEDICAL BUILDING

## 6. LIBERAL PROGRAM (48 REQUIRED CREDITS)

The Liberal program is the most flexible. It provides a student with a useful concentration in Microbiology and Immunology. Students are required to do at least one minor or minor/concentration in another discipline. A grade of C or better must be obtained in all required courses. A student who has obtained a CGPA of 3.2 or better is eligible to apply for admission to the graduate program in the Department of Microbiology and Immunology. However, it is recommended that students who intend to proceed to Graduate Studies select the Major or Honours program.

| Course | Credits | Department | Title |
|---|---|---|---|
| **Required statistics course to be taken in U1, U2 or U3 year (3 credits)** | | | |
| BIOL 373 (F) | (3) | Biology | Biostatistical Analysis |
| **or** | | | |
| MATH 203 (F or W) | (3) | Math | Principles of Statistics 1 |
| **or** | | | |
| PSYC 204 (F or W) | (3) | Psychology | Introduction to Psychological Statistics |
| **U1 Required Courses (21 credits)** | | | |
| MIMM 211 (F) | (3) | Micro. & Immuno. | Introductory Microbiology |
| MIMM 212 (F) | (2) | Micro. & Immuno. | Laboratory in Microbiology |
| MIMM 214 (W) | (3) | Micro & Immuno | Introduction to Immunology |
| BIOL 200 (F) | (3) | Biology | Molecular Biology |
| BIOL 201 (W) | (3) | Biology | Cell Biology and Metabolism |
| **or** | | | |
| BIOC 212 (W) | (3) | Biochemistry | Molecular Mechanisms of Cell Function |
| BIOL 202 (W) | (3) | Biology | Basic Genetics |
| CHEM 212 (F or W)* | (4) | Chemistry | Organic Chemistry 1 |
| **U2 Required Courses (15 credits)** | | | |
| MIMM 314 (W) | (3) | Micro. & Immuno. | Immunology |
| MIMM 323 (F) | (3) | Micro. & Immuno. | Microbial Physiology |
| MIMM 324 (F) | (3) | Micro. & Immuno. | Fundamental Virology |
| MIMM 386D1 (F) | (3) | Micro. & Immuno. | Laboratory in Micro.& Immuno. |
| MIMM 386D2 (W) | (3) | Micro. & Immuno. | Laboratory in Micro.& Immuno. |

If you have passed a CEGEP course that is equivalent to a McGill course , you are exempt from that McGill course and will not receive McGill credit if you take it. Some CEGEP courses provide McGill exemptions no matter what CEGEP you were attending when you took them, while other courses provide exemptions only if taken at certain CEGEPs. To make sure you receive all the exemptions you qualify for, check this link: **http://www.mcgill.ca/students/transfercredit/prospective/cegep**

## LIBERAL PROGRAM (continued)

**U3 Required Courses (6 credits)**

At least 6 credits must be in courses offered by the Department of Microbiology and Immunology (See list below). The remaining credits must be chosen from the complementary course list. Most flexible program providing space for additional minor or major programs concentration.

| Course | Credits | Department | Title |
|---|---|---|---|
| **6 credits from courses offered by the Department of Microbiology and Immunology** | | | |
| MIMM 387 (W) | (3) | Micro. & Immuno. | Applied Micro. & Immuno. |
| MIMM 413 (W) | (3) | Micro. & Immuno. | Parasitology |
| MIMM 414 (A) | (3) | Micro. & Immuno. | Advanced Immunology |
| MIMM 465 (A) | (3) | Micro. & Immuno. | Bacterial Pathogenesis |
| MIMM 466 (W) | (3) | Micro. & Immuno. | Viral Pathogenesis |
| MIMM 509 (W) | (3) | Micro. & Immuno. | Inflammatory Processes |

**Complementary Courses in U-1, U-2 OR U-3: (6 credits)**
**3 credits must be taken from the following:**

| | | | |
|---|---|---|---|
| BIOL 300 (F) | (3) | Biology | Molecular Biology of the Gene |
| BIOL 314 (F) | (3) | Biology | Molecular Biology of Oncogenes |
| CHEM 203 (F) | (3) | Chemistry | Survey of Physical Chemistry |
| **or** | | | |
| CHEM 204 (F or W) | (3) | Chemistry | Intro. to Physical Chemistry/Biol.Science |
| CHEM 222 (F or W) | (4) | Chemistry | Organic Chemistry 2 |
| CHEM 302 (F) | (3) | Chemistry | Organic Chemistry 3 |
| BIOT 505 (W) | (3) | Biotechnology | Selected Topics in Biotechnology |
| ANAT 261 (F) | (4) | Anatomy | Introduction to Dynamic Histology |
| ANAT 262 (W) | (3) | Anatomy | Intro. Molecular and Cellular Biology |
| ANAT 365 (F) | (3) | Anatomy | Cell Biology of the Secretory Processes |
| ANAT 458 (W) | (3) | Anatomy | Membranes & Cellular Signalling |
| **or** | | | |
| BIOC 458 (W) | (3) | Biochemistry | Membranes & Cellular Signalling |
| BIOC 311 (F) | (3) | Biochemistry | Metabolic Biochemistry |
| BIOC 312 (W) | (3) | Biochemistry | Biochemistry of Macromolecules |
| BIOC 450 (F) | (3) | Biochemistry | Protein Structure and Function |
| BIOC 454 (F) | (3) | Biochemistry | Nucleic Acids |
| BIOC 458 (W) | (3) | Biochemistry | Membranes & Cellular Signalling |
| EXMD 504 (F) | (3) | Experimental Med. | Biology of Cancer |

**Complementary course list continued next pg.....**

## LIBERAL PROGRAM (continued)

| Course | Credits | Department | Title |
|---|---|---|---|
| MIMM 387 (W) | (3) | Micro. & Immuno. | Applied Microbiology and Immunology |
| MIMM 413 (W) | (3) | Micro. & Immuno. | Parasitology |
| MIMM 414 (F) | (3) | Micro. & Immuno. | Advanced Immunology |
| MIMM 465 (F) | (3) | Micro. & Immuno. | Bacterial Pathogenesis |
| MIMM 466 (W) | (3) | Micro. & Immuno. | Viral Pathogenesis |
| MIMM 509 (W) | (3) | Micro. & Immuno. | Inflammatory Processes |
| PATH 300 (W) | (3) | Pathology | Human Disease |
| PHAR 300 (F) | (3) | Pharmacology | Drug Action |
| PHAR 301 (W) | (3) | Pharmacology | Drugs and Diseases |
| PHGY 209 (F) | (3) | Physiology | Mammalian Physiology 1 |
| PHGY 210 (W) | (3) | Physiology | Mammalian Physiology 2 |

## 7. MAJOR PROGRAM (67 REQUIRED CREDITS)

The Major Program is designed for students who want to acquire a substantial background in microbiology and immunology and related disciplines (chemistry, biology, biochemistry) which will prepare them for professional schools, graduate education, or entry into jobs in industry or research institutes. A grade of C or better must be obtained in all required courses. A student who has obtained a CGPA of 3.2 or better is eligible to apply for admission to the graduate program in the Department of Microbiology and Immunology.

| Course | Credits | Department | Title |
|---|---|---|---|
| **Required statistics course to be taken in U1, U2 or U3 year (3 credits)** | | | |
| BIOL 373 (F) | (3) | Biology | Biostatistical Analysis |
| **or** | | | |
| MATH 203 (F or W) | (3) | Math | Principles of Statistics 1 |
| **or** | | | |
| PSYC 204 (F or W) | (3) | Psychology | Introduction to Psychological Statistics |
| **U1 Required Courses (25 credits)** | | | |
| MIMM 211 (F) | (3) | Micro. & Immuno. | Introductory Microbiology |
| MIMM 212 (F) | (2) | Micro. & Immuno. | Laboratory in Microbiology |
| MIMM 214 (W) | (3) | Micro & Immuno | Introduction to Immunology |
| BIOL 200 (F) | (3) | Biology | Molecular Biology |
| BIOL 201 (W) | (3) | Biology | Cell Biology and Metabolism |
| **or** | | | |
| BIOC 212 (W) | (3) | Biochemistry | Molecular Mechanisms of Cell Function |
| BIOL 202 (W) | (3) | Biology | Basic Genetics |
| CHEM 212 (F or W)* | (4) | Chemistry | Organic Chemistry 1 |
| CHEM 222 (F or W)* | (4) | Chemistry | Organic Chemistry 2 |

* **If you have passed a CEGEP course that is equivalent to a McGill course, you are exempt from that McGill course and will not receive McGill credit if you take it. Some CEGEP courses provide McGill exemptions no matter what CEGEP you were attending when you took them, while other courses provide exemptions only if taken at certain CEGEPs. To make sure you receive all the exemptions you qualify for, check this link:**
**http://www.mcgill.ca/students/transfercredit/prospective/cegep**

## MAJOR PROGRAM (continued)

| Course | Credits | Department | Title |
|---|---|---|---|
| **U2 Required Courses (21 credits)** | | | |
| MIMM 314 (W) | (3) | Micro. & Immuno. | Immunology |
| MIMM 323 (F) | (3) | Micro. & Immuno. | Microbial Physiology |
| MIMM 324 (F) | (3) | Micro. & Immuno. | Fundamental Virology |
| MIMM 386D1 (F) | (3) | Micro. & Immuno. | Laboratory in Micro.& Immuno. |
| MIMM 386D2 (W) | (3) | Micro. & Immuno. | Laboratory in Micro.& Immuno. |
| BIOC 311 (F) | (3) | Biochemistry | Metabolic Biochemistry |
| BIOC 312 (W) | (3) | Biochemistry | Biochemistry of Macromolecules |

***These courses are prerequisites for MIMM465 (F) and MIMM466 (W), and therefore must be taken in U2.**

**U3 Required Courses (9 credits)**

| | | | |
|---|---|---|---|
| MIMM 413 (W) | (3) | Micro. & Immuno. | Parasitology |
| MIMM 465 (F) | (3) | Micro. & Immuno. | Bacterial Pathogenesis |
| MIMM 466 (W) | (3) | Micro. & Immuno. | Viral Pathogenesis |

**Complementary Courses in U-1, U2 OR U3 (9 credits)**
**An additional 9 credits selected from:**

| | | | |
|---|---|---|---|
| ANAT 261 (F) | (4) | Anatomy | Introduction to Dynamic Histology |
| ANAT 262 (W) | (3) | Anatomy | Intro. Molecular and Cellular Biology |
| ANAT 458 (W) | (3) | Anatomy | Membranes & Cellular Signaling |
| **or** BIOC 458 (W) | (3) | Biochemistry | Membranes & Cellular Signaling |
| ANAT 365 (F) | (3) | Anatomy | Cell Biology of the Secretory Processes |
| BIOL 300 (F) | (3) | Biology | Molecular Biology of the Gene |
| BIOL 314 (F) | (3) | Biology | Molecular Biology of Oncogenes |
| BIOC 450 (F) | (3) | Biochemistry | Protein Structure and Function |
| BIOC 454 (F) | (3) | Biochemistry | Nucleic Acids |
| BIOT 505 (W) | (3) | Biotechnology | Selected Topics in Biotechnology |
| CHEM 203 (F) | (3) | Chemistry | A Survey of Physical Chemistry |
| **or** | | | |
| CHEM 204 (F or W) | (3) | Chemistry | Introductory Physical Chemistry for Biological Science Students |
| CHEM 302 (F) | (3) | Chemistry | Organic Chemistry 3 |
| EXMD 504 (F) | (3) | Experimental Med. | Biology of Cancer |
| MIMM 387 (W) | (3) | Micro. & Immuno. | Applied Microbiology and Immunology |
| MIMM 414 (F) | (3) | Micro. & Immuno. | Advanced Immunology |
| MIMM 509 (W) | (3) | Micro. & Immuno. | Inflammatory Processes |



**Complementary course list continued next pg.....**

## MAJOR PROGRAM (continued)

| Course | Credits | Department | Title |
|---|---|---|---|
| PATH 300 (W) | (3) | Pathology | Human Disease |
| PHAR 300 (F) | (3) | Pharmacology | Drug Action |
| PHAR 301 (W) | (3) | Pharmacology | Drugs and Diseases |
| PHGY 209(F) | (3) | Physiology | Mammalian Physiology 1 |
| PHGY 210 (W) | (3) | Physiology | Mammalian Physiology 2 |

# 8. HONOURS PROGRAM (73 REQUIRED CREDITS)

The Honours program in Microbiology and Immunology combines the substantial background given by the Major program with a challenging opportunity to carry out a laboratory research project in the U-3 year. The required courses that are part of the Honours program offer broad exposure to different areas important to the biomedical sciences, as well as a high degree of specialization in these disciplines. These courses prepare students for a significant research experience under the direct supervision of a professor in the Department. Those who are considering careers in research in the biological sciences or in medicine, or employment in the biotechnology field, are encouraged to take advantage of the special opportunities offered by this Honours program.

Students intending to apply to the Honours program must complete the Major program in U-1 and U-2. A CGPA of at least 3.5 must be obtained by the end of the U-2 year in order to enter the Honours in U-3.

The Honours research project course, Independent Studies in Microbiology and Immunology (MIMM 502 D1, D2), is a unique opportunity to gain first-hand research experience, to design and execute scientific experiments using sophisticated methods and equipment, and to participate in the dynamic and creative interactions that contribute to scientific discovery. Students in the project course work in the laboratory alongside a professor, graduate students, and research assistants during two terms. They learn to communicate science in writing and by a seminar presentation. See the course description for registration requirements.

**Students who wish to apply to the Honours program must indicate in writing to Jennifer DiMassimo, Student Affairs Officer, by the third Monday of February of their U-2 year. Since there are a limited number of places available in MIMM 502 D1, D2 registration requires approval of the Department.** For graduation from the Honours program, a student must pass all required courses at a level of C or better, and must achieve a sessional GPA of at least 3.3 in U-3.

| Course | Credits | Department | Title |
|---|---|---|---|
| **Required statistics course to be taken in U-1, U-2 OR U-3 year (3 credits)** | | | |
| BIOL 373 (F) | (3) | Biology | Biostatistical Analysis |
| **or** | | | |
| MATH 203 (F or W) | (3) | Math | Principles of Statistics 1 |
| **or** | | | |
| PSYC 204 (F or W) | (3) | Psychology | Introduction to Psychological Statistics |
| **Required courses in U-1 and U-2 (46 credits)** | | | |
| **Required courses of the Honours Program are the same, as the U-1 and U-2 required courses of the Major Program.** | | | |

## HONOURS PROGRAM (continued)

| Course | Credits | Department | Title |
|---|---|---|---|
| **U3 Required Courses (21 credits)** | | | |
| MIMM 413 (W) | (3) | Micro. & Immuno. | Parasitology |
| MIMM 465 (F) | (3) | Micro. & Immuno. | Bacterial Pathogenesis |
| MIMM 466 (W) | (3) | Micro. & Immuno. | Viral Pathogenesis |
| MIMM 502D1 (F) | (6) | Micro. & Immuno. | Honours Research Project |
| MIMM 502D2 (W) | (6) | Micro. & Immuno. | Honours Research Project |
| **Complementary Courses (3 credits)** | | | |
| **In addition, U-3 students must take one course (3 credits) from the following:** | | | |
| BIOL 520 (W) | (3) | Biology | Gene Activity in Development |
| BIOT 505 (W) | (3) | Biotechnology | Selected Topics in Biotechnology |
| BIOC 404 (W) | (3) | Biochemistry | Biophysical Chemistry |
| BIOC 450 (F) | (3) | Biochemistry | Protein Structure and Function |
| BIOC 454 (F) | (3) | Biochemistry | Nucleic Acids |
| BIOC 455 (W) | (3) | Biochemistry | Neurochemistry |
| BIOC 458 (W) | (3) | Biochemistry | Membranes and Cellular Signaling |
| **or** ANAT 458 (W) | (3) | Anatomy | Membranes and Cellular Signaling |
| MIMM 414 (F) | (3) | Micro. & Immuno. | Advanced Immunology |
| MIMM 509 (W) | (3) | Micro. & Immuno. | Inflammatory Processes |
| PHAR 562 (F) | (3) | Pharmacology | General Pharmacology 1 |
| PHAR 563 (W) | (3) | Pharmacology | General Pharmacology 2 |

# 9. SUMMARY OF UNDERGRADUATE PROGRAM REQUIREMENTS

**DEPARTMENTAL PREFIX:**

**ANAT** = Anatomy
**BIOL** = Biology
**BIOC**= Biochemistry
**BIOT** = Biotechnology
**CHEM** = Chemistry
**EXMD** = Exp. Medicine
**MATH** = Mathematics
**MIMM** = Microbiology & Immunology
**PHAR** = Pharmacology
**PATH** = Pathology
**PHGY** = Physiology
**PSYC** = Psychology

| | LIBERAL | MAJOR | HONOURS | |
|---|---|---|---|---|
| U1 | MIMM 211 (F) (3) | MIMM 211 (F) (3) | MIMM 211 (F) (3) | |
| | MIMM 212 (F) (2) | MIMM 212 (F) (2) | MIMM 212 (F) (2) | |
| | MIMM 214 (W) (3) | MIMM 214 (W) (3) | MIMM 214 (W) (3) | |
| | BIOL 200 (F) (3) | BIOL 200 (F) (3) | BIOL 200 (F) (3) | |
| | BIOL 201 OR BIOC 212(W) (3) | BIOL 201(W) or BIOC 212(W) (3) | BIOL 201(W) or BIOC 212(W) (3) | |
| | BIOL 202 (W) (3) | BIOL 202 (W) (3) | BIOL 202 (W) (3) | |
| | CHEM 212 (F or W) (4) | CHEM 212 (F or W) (4) | CHEM 212 (F or W) (4) | |
| | | CHEM 222 (F or W) (4) | CHEM 222 (F or W) (4) | |
| | | | | |
| | 21 credits | 25 credits | 25 credits | |
| U2 | MIMM 314 (W) (3) | MIMM 314 (W) (3) | MIMM 314 (W) (3) | |
| | MIMM 323 (F) (3) | MIMM 323 (F) (3) | MIMM 323 (F) (3) | |
| | MIMM 324 (F) (3) | MIMM 324 (F) (3) | MIMM 324 (F) (3) | |
| | MIMM 386D1 (F) (3) | MIMM 386D1 (F) (3) | MIMM 386D1 (F) (3) | |
| | MIMM 386D2 (W) (3) | MIMM 386D2 (W) (3) | MIMM 386D2 (W) (3) | |
| | | BIOC 311 (F) (3) | BIOC 311 (F) (3) | |
| | | BIOC 312 (W) (3) | BIOC 312 (W) (3) | |
| | | | | |
| | 15 credits | 21 credits | 21 credits | |
| U3 | Total of 12 credits:<br>- at least 6 from MIMM courses listed on page 9<br>- plus 3 credits from the list on pages 9 and 10 | MIMM 413 (W) (3) | MIMM 413 (W) (3) | |
| | | MIMM 465 (F) (3) | MIMM 465 (F) (3) | |
| | | MIMM 466 (W) (3) | MIMM 466 (W) (3) | |
| | | | MIMM 501 or 502 D1 (F) (6) | |
| | | | MIMM 501 or 502 D2 (W) (6) | |
| | | + 9 credits from List on pages 12 & 13 | + 3 credits from List on page 15 | |
| | 12 credits | 18 credits | 24 credits | |
| SUM | 48 CREDITS* | 67 CREDITS* | 73 CREDITS* | |

***Total credits includes 3 credits for BIOL 373 or MATH 203 or PSYC 204.Statistics course for all programs, to be taken in U1 or U2 or U3**

## 10. INTERDEPARTMENTAL HONOURS IMMUNOLOGY PROGRAM
**(75 required credits)**

The Honours Program in Immunology is offered by three Departments: Biochemistry, Microbiology and Immunology, and Physiology combining elements of each. The program is a demanding one which will prepare the student for graduate work in immunology.

All admissions to the Honours program will be after completion of the U1 year, and a student must have completed 30 credits of U1 courses with a minimum GPA of 3.3. Admission to U3 requires a minimum CGPA of 3.3 in U2. Students who do not maintain Honours standing must transfer their registration to a program in one of the three participating Departments.

For graduation in the Honours program, the student must complete a minimum of 90 credits, and achieve a CGPA of not less than 3.3. In addition, the five core immunology courses must be passed with a grade not less than B. This program is comprised of a core of 56 credits in basic science courses in cell and molecular biology, microbiology, biochemistry and physiology. An additional 21 credits in complementary science courses may be selected from a broad selection of science courses. The remaining 13 credits are free electives to enable the student to explore related science disciplines. An undergraduate research project, seminar and thesis provides and opportunity to directly experience research work in a laboratory with a professor of immunology.

All U1 students who are interested in the program are advised to register in either the Faculty or Major program in Biochemistry or Physiology, or the Major program in Microbiology and Immunology. During their U1 year, students intending to enter the program should inform their advisers of their intent to enter the Honours Immunology Program in U2.

**Students wishing to enter the program must formally apply in writing by April 1 to Dr. Ciriaco A. Piccirillo, Department of Microbiology and Immunology, Montreal General Hospital 1650 Cedar Avenue Room L11.132-144 Montreal, QC H3G 1A4 Tel: (514) 934-1934 ext: 45135 Fax: (514) 934-8332 Email: ciro.piccirillo@mcgill.ca) or Dr. Monroe Cohen, Department of Physiology, Room 1136, McIntyre Medical Sciences Building, 3655 Drummond Street, Montreal, QC, H3G 1Y6 (Telephone 398-4342, Email: Monroe.cohen@mcgill.ca).**

All U1 candidates will be interviewed prior to admission. Enrolment is limited and admission may be denied if demand exceeds the number of available places.

## INTERDEPARTMENTAL HONOURS IMMUNOLOGY PROGRAM (continued)

| Course | Credits | Department | Title |
|---|---|---|---|
| **U-1 Required courses (20 credits)** | | | |
| BIOL 200 | (3) | Biology | Molecular Biology |
| BIOL 201 | (3) | Biology | Cell Biology and Metabolism |
| **or** BIOC 212 | (3) | Biochemistry | Molecular Mechanisms of Cellular Function |
| CHEM 212 | (4) | Chemistry | Introductory Organic Chemistry 1 |
| CHEM 222[1] | (4) | Chemistry | Introductory Organic Chemistry 2 |
| MIMM 214 | (3) | Micro & Immuno | Introduction to Immunology |
| PHGY 209 | (3) | Physiology | Mammalian Physiology I |
| **or** MIMM 211 | (3) | Micro. & Immuno | Introductory Microbiology |
| **U-1 Complementary courses (6 credits)** | | | |
| **3 credits selected from:** | | | |
| BIOL 373 **or** | (3) | Biology | Biometry |
| MATH 203 **or** | (3) | Mathematics | Principles and Methodology of Stats 1 |
| PSYC 204 | (3) | Psychology | Introduction to Psychological statistics |
| **Plus 3 credits selected from:** | | | |
| ANAT 214 | (3) | Anatomy | Systematic Human Anatomy |
| ANAT 262 | (3) | Anatomy | Intro Molecular and Cell Biol. |
| BIOL 202 | (3) | Biology | Basic Genetics |
| BIOL 205 | (3) | Biology | Biology of Organisms |
| BIOL 304 | (3) | Biology | Evolution |
| CHEM 203 | (3) | Chemistry | A Survey of Physical Chemistry |
| **or** CHEM 204 | (3) | Chemistry | Introductory Physical Chemistry for Biological Science Students |
| CHEM 287 | (2) | Chemistry | Introductory Analytical Chemistry |
| CHEM 297 | (1) | Chemistry | Intro. Analytical Chemistry Laboratory |
| COMP 202 | (3) | Computer Science | Introduction to Computing 1 |
| COMP 203 | (3) | Computer Science | Introduction to Computing 2 |
| MATH 204 | (3) | Math | Principles of Statistics 2 |
| MIMM 211 | (3) | Micro. & Immuno. | Biology of Microorganisms |
| MIMM 212 | (2) | Micro. & Immuno. | Laboratory in Microbiology |
| PHGY 209 | (3) | Physiology | Mammalian Physiology 1 |
| PHGY 210 | (3) | Physiology | Mammalian Physiology 2 |

## IHI Program (continued)

**(26) credits to be obtained by these required courses in U-1**

* Students entering Microbiology from CEGEP are usually exempted from Chemistry CHEM 212, having already taken it in CEGEP (202-202). Students who come from out-of-province must take CHEM 212, which is a prerequisite for CHEM 222.

! Students who have taken Organic Chemistry II in CEGEP (202-302) are exempted from Chemistry CHEM 222.

# Students must take this course in U-1 or U-2.

| Course | Credits | Department | Title |
|---|---|---|---|
| **U2 Required courses (13 credits)** | | | |
| ANAT 261 | (4) | Anatomy | Introduction to Dynamic Histology |
| BIOC 311 | (3) | Biochemistry | Metabolic Biochemistry |
| BIOC 312 | (3) | Biochemistry | Biochemistry of Macromolecules |
| MIMM 314 | (3) | Micro. & Immuno. | Immunology |
| **U2 Complementary courses (12 credits)** | | | |
| **6 credits selected from:** | | | |
| BIOC 300D1,2(6) | | Biochemistry | Laboratory in Biochemistry |
| **or** | | | |
| MIMM 386D | (6) | Micro. & Immuno. | Lab in Microbiology & Immuno. |
| **or** PHGY 212(1) | | Physiology | Introduction Physiology Lab 1 |
| **and** PHGY 213(1) | | Physiology | Introduction Physiology Lab 2 |
| **and** BIOL 301(4) | | Biology | Cell & Molecular Laboratory |
| **plus two courses, 6 credits selected from:** | | | |
| ANAT 365 | (3) | Anatomy | Cell Biology: Secretory Process |
| BIOL 300 | (3) | Biology | Molecular Biology of the Gene |
| BIOL 314 | (3) | Biology | Molecular Biology of Oncogenes |
| CHEM 302 | (3) | Chemistry | Introductory Organic Chemistry 3 |
| MATH 222 | (3) | Math & Stats. | Calculus 3 |
| MATH 315 | (3) | Math & Stats. | Ordinary Differential Equations |
| **or** BIOL 309 | (3) | Biology | Mathematical Models in Biology |
| MIMM 323 | (3) | Micro. & Immuno. | Microbial Physiology |
| MIMM 324 | (3) | Micro. & Immuno. | Fundamental Virology |
| PATH 300 | (3) | Pathology | Human Disease |
| PHAR 300 | (3) | Pharmacology | Drug Action |
| PHAR 301 | (3) | Pharmacology | Drugs and Disease |
| PHAR 303 | (3) | Pharmacology | Principles of Toxicology |
| PHGY 311 | (3) | Physiology | Intermediate Physiology 1 |
| PHGY 312 | (3) | Physiology | Respiratory, Renal & Cardiovascular Physiology |
| PHGY 313 | (3) | Physiology | Blood, Gastrointestinal & Immune System Physiology |
| PHGY 314 | (3) | Physiology | Integrative Neuroscience |

**(25) credits to be obtained by these required courses in U-2**

## IHI Program (continued)

**U-3 Required courses (15 credits)**

| Course | Credits | Department | Title |
|---|---|---|---|
| MIMM 414 | (3) (F) | Micro. & Immuno. | Advanced Immunology |
| PHGY 419D1,2 | (9) | Physiology | Project and Seminar in Immunology |
| PHGY 513 | (W)(3) | Physiology | Cellular Immunology |

**U-3 Complementary courses (9 credits)**

**3 credits selected from:**

| | | | |
|---|---|---|---|
| PHAR 503 | (3)(W) | Pharmacology | Drug Design & Development 1 |
| PHGY 531 | (3)(W) | Physiology | Topics in Applied Immunology |
| MIMM 509 | (3)(W) | Micro. & Immuno. | Inflammatory Processes |

**Plus 6 credits selected from:**

| | | | |
|---|---|---|---|
| BIOL 520 | (3) | Biology | Gene Activity in Development |
| BIOC 404 | (3)(W) | Biochemistry | Biophysical Chemistry |
| BIOC 450 | (3)(F) | Biochemistry | Protein Structure and Function |
| BIOC 454 | (3)(F) | Biochemistry | Nucleic Acids |
| BIOC 458 | (3)(W) | Biochemistry | Membranes & Cellular Signaling |
| **or** ANAT 458 | (3) | Anatomy | Membranes & Cellular Signaling |
| BIOC 503 | (3)(W) | Biochemistry | Immunochemistry |
| MIMM 413 | (3)(W) | Micro. & Immuno. | Parasitology |
| MIMM 465 | (3)(F) | Micro. & Immuno. | Bacterial Pathogenesis |
| MIMM 466 | (3)(W) | Micro. & Immuno. | Viral Pathogenesis |
| MIMM 509 | (3)(W) | Micro. & Immuno. | Inflammatory Processes |
| PHAR 503 | (3)(F) | Pharmacology | Drug Design & Development 1 |
| PHAR 504 | (3)(W) | Pharmacology | Drug Design & Development 2 |
| PHGY 531 | (3)(W) | Physiology | Topics in Applied Immunology |
| PHGY 552 | (3)(W) | Physiology | Cellular and Molecular Physiology |

**(24) credits to be obtained by these required courses in U-3**

**(75) TOTAL NUMBER OF REQUIRED CREDITS IN U-1, U-2, AND U-3**

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MIMM 501/502

MIMM 509

# MIMM 211 Biology of Microorganisms

## Description

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.

**3 credits — Fall Term**
**Co-requisite:** [short BIOL 200]
**Lectures:** MWF 10:35 - 11:25
course_outline_mimm211_2012-final.pdf

## Details

### Course Coordinator

Dr. Benoit Cousineau
Duff Medical Building
Room 617
Tel: (514) 398-8929
Fax: (514) 398-7052
Email

### Lecturers

Dr. B. Cousineau

Dr. J. Fritz

Dr. S. Gruenheid

Dr. G. Matlashewski

Dr. M. Olivier

Dr. D. Sheppard

**Evaluation**

- Mid-Term Examination: **25%**
- Final Examination: **75%**

**Course Text**

*MICROBIOLOGY*, 7e or 8e, by L.M. Prescott, J.P. Harley, and D.A. Klein. McGraw-Hill, New York, NY 10020.

**In Depth**

This course gives a general introduction to the world of microorganisms with particular emphasis on the properties of procaryotic cells and viruses. The basic principles of immunology as well as the basic processes of molecular biology are also introduced. Thus this course gives a comprehensive overview of microbiology, immunology and molecular biology. It serves as a prerequisite for several courses in the Department. The students acquire a general knowledge and understanding of the microbial world.

**Topics**

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- Nature of the procaryotic cell
- Microbial diversity
- Morphology and fine structure of bacteria
- Nutrition and cultivation of microorganisms
- Factors affecting growth of microbes
- Growth and death of bacteria
- Bacterial systematics
- Bacterial genetics: neo-classical control of gene expression
- Bacterial heredity and gene expression
- Regulation of chromosome structure and function
- Bacterial pathogenesis
- Epidemiology of infectious diseases
- Introduction to the Fungi
- Protozoa
- Introduction to virology: virus-cell interactions
- Viral replication
- Virus-host interactions
- General immunology and anatomy of the immune system
- Humoral immunity: antibodies and complement
- Cellular immunity
- Hypersensitivity and transplantation
- Innate immunity and phagocytosis
- Immunity and bacterial diseases; vaccination
- Immunity and viral diseases; cancer
- Tumour immunology and immunodeficiencies

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# MIMM 212 Laboratory in Microbiology

## Description

This laboratory course is designed to complement MIMM 211. Sessions introduce general techniques for the handling of microorganisms.

**2 credits — Fall Term**
**Co-requisite:** Biology of Microorganisms **MIMM 211**
**Lecture:** T 1:35 - 1:55 p.m.
**Laboratory:** T 2 - 5 p.m.
**Lab Follow-up:** Th 2:35 - 3:25 p.m.
mimm212_outline_2012.pdf

## Details

### Course Coordinator

Dr. Samantha Gruenheid
McGill Life Sciences Complex
Bellini Pavilion, Room 365
3649 Promenade Sir William Osler
Montreal, QC, Canada H3G 0B1
Tel: 514-398-2138
Lab: 514-398-3066
Fax: 514-398-2603
Email

### Course Lecturers

Dr. M. Behr

Dr. D. Sheppard

### Laboratory Coordinator

Ms. Aghdas Zamani
Lyman Duff Medical Building
Room D5
Tel: (514) 398-5072
Email

### Evaluation

- Demonstrator evaluation lab skills, lab reports, quizzes: **50%**
- Final examination: **50%**

### Course Text

*Laboratory Manual of Microbiology*. Available from the Department of Microbiology and Immunology. This manual is an adaptation from *Laboratory Exercises in Microbiology*, E.C.S. Chan, M.J. Pelczar, Jr. and Noel R. Krieg, 6/e, McGraw-Hill Book Company, N.Y. 1993.

### In Depth

This laboratory course is designed to complement the lecture course, Biology of Microorganisms (MIMM211). The student is introduced to the basic manipulations for the handling of microorganisms and is taught the concept of aseptic technique. While the bacteria are the main organisms handled, molds, yeasts and phages are also

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introduced. Main procedures in the characterization of bacteria are in the initial part of the course. The students acquire hands-on experience in the safe handling of microorganisms and in keeping out unwanted contaminants.

**Topics**

- Staining the whole cell; staining for cell structures
- Streak-plate method for isolation of pure cultures
- Selective, differential and enriched media
- Anaerobic culture methods
- Cultural characteristics
- Hydrolysis of polysaccharide, protein, lipid
- Fermentation of carbohydrates
- Additional biochemical characteristics
- Morphological, cultural and biochemical characterization of unknown cultures
- Morphological and cultural characteristics of molds
- Sexual reproduction of molds
- Morphology of yeasts
- Antibiotics: agar-diffusion method
- Enumeration of bacteria by the plate-count technique
- Bacterial lysis by bacteriophage
- Phage-typing
- Demonstration of tissue cultures
- Bacterial genetics
- Airborne infections/Contact diseases/Foodborne and waterborne diseases

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# MIMM 214 Introductory Immunology: Elements of Immunity

## Description

The curriculum in Immunology is structured as a ribbon of courses extending from U1 to U3. In each of these years, there is a corresponding Immunology course that provides an introduction to the discipline (MIMM214), a mechanistic approach to Immunology (MIMM314) and an advanced exposure to current topics in Immunology (MIMM414).

MIMM214 is an introductory course providing an entry-level exposure to Immunology to a broad range of students: from those in a general science program to those going into Microbiology and Immunology as field of specialization.

As an introductory course, it emphasizes the description of molecular and cellular elements of the immune system, and their basic function. Emphasis is also placed in the biological context in which these elements operate to provide immunity and how the impairments of their function may result in diseases.

The course will provide the required basis to tackle subsequent more advanced courses in Immunology.

**3 credits - Winter Term**

**Prerequisite:** BIOL200

**Co-requisite:** BIOL201 or ANAT212/BIOC212

**Lecture:** M-W-F 2:35 p.m. - 3:25 p.m. **Location:** Adams Auditorium

## Course Content and Calendar

2012-13_course_outline_final.docx

## Details

**Course Coordinator**

**Dr. J. (Quim) Madrenas**

Professor and Chair, Department of Microbiology & Immunology

Duff Medical Building, Room 511

Tel: 514-398-3914

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Fax: 514-398-7052

E-mail

**Office hours**: (By appointment only) Tuesdays from 3:00 p.m. - 5:00 p.m. To make an appointment, Contact Ms. Ireini Ghobri or at (514) 398-7492.

## Notes

- Required course for U1 Microbiology & Immunology students.
- Required course for Major Neuroscience (Stream A) students.

## Instructional Method

Interactive lectures with pro-active student participation and discussion. It is highly recommended that students come to class having read the material for the particular lecture.

## Learning Outcomes

After taking this course students should be able to:

- To use standard terminology in the field of Immunology
- To list the cells and some of the molecules involved in immunity
- To describe the organs of the immune system
- To describe the main steps in the generation of cells of the immune system
- To describe the basic mechanisms that provide innate immunity
- To define inflammation and list the cellular and molecular players of inflammatory responses
- To define cytokines and chemokines
- To describe antigen processing and presentation
- To describe antibodies and antigen receptors on lymphocytes
- To explain cellular and molecular features of lymphocyte activation
- To describe the main steps in the development of adaptive immunity
- To explain cell-mediated adaptive immune responses against viruses and intracellular pathogens
- To explain antibody-mediated adaptive immune responses against extracellular pathogens and parasites
- To list basic mechanisms that regulate immune responses
- To define immunological memory from an operational point of view
- To define, list mechanisms, and provide examples of immune tolerance
- To explore the biological and clinical implications of immune mechanisms

## Course Material

Janeway's Immunobiology, 8th edition, Murphy, K. Garland Science, 2012. Also available as iPAD textbook (inkling). Textbook is required.

## Course Evaluation

- Midterm exam worth 40% of final mark and covering from first lecture to the lecture before Midterm exam.
- Final exam worth 60% of final mark. The final exam will cover material from the first lecture after the midterm exam until the last lecture of the course.
- Both exams will be based on Multiple Choice Questions with 5 options, only 1 of which is correct.

## McGill Policy Statements

1) McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures" (see www.mcgill.ca/students/srr/honest/ for more information).

L'université McGill attache une haute importance à l'honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l'on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l'étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le site www.mcgill.ca/students/srr/honest/).

2) In accord with McGill University's Charter of Students' Rights, students in this course have the right to submit in English or in French any written work that is to be graded.

Conformément à la Charte des droits de l'étudiant de l'Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l'un des objets est la maîtrise d'une langue).

3) In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.

4) If you have a disability please contact the instructor to arrange a time to discuss your situation. It would be helpful if you contact the Office for Students with Disabilities at 514-398-6009 before you do this.

5) McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill.

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# MIMM 314 Immunology

## Description

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. MIMM314 provides basic knowledge of immunology, the molecular mechanisms of innate and adaptive immunity, and the immune system in health and disease.

**3 credits — Winter Term**
**Pre-requisites: BIOL 200** Molecular Biology , **BIOL 201** Cell Biology & Metabolism , or **BIOC 212** Molec Mechanisms of Cell Funct
**Lectures:** T/Th 08:35 - 09:55

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## Details

### Course Coordinator

Dr. Ciro Piccirillo
Montreal General Hospital
1650 Cedar Avenue
Room L11.132-144
Montreal, QC H3G 1A4
Tel: (514) 934-1934 ext: 45135
Fax: (514) 934-8332
Email

### Lecturers

- Dr. R. Alizadehfar
- Dr. S. Fournier
- Dr. C. Krawczyk
- Dr. J. Madrenas
- Dr. C. McCusker (514) 412-4470
- Dr. C. Piccirillo
- Dr. C. Tsoukas

### Evaluation

- Mid-Term Examinations (2 x 20%) - 40%
- Final Examination - 60%

### Course Text

Janeway's Immunobiology, 7th Edition. ISBN 0815341237; Garland Publishing Inc.Immunobiology: The Immune System in Health and Disease, 5th Edition. Janeway, Travers, Walport, Shlomchik; Garland Publishing Inc.

### In Depth

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With knowledge gained primarily in mouse and human, the following are studied in sufficient detail to provide a basis for reading original biomedical research papers (as required in MIMM414, for example): Anatomical and functional description of lymphoid tissues and hematopoietic lineages; Several of the important molecules and mechanisms of innate immunity; The differentiation and selection of T and B lymphocytes and the generation of receptor and immunoglobulin diversity; Antigen processing and presentation; Lymphocyte activation and effector functions, including some intracellular signalling pathways; Intercellular signalling in the control of cell trafficking, activation and activity; Allergy; Self and non-self recognition as it relates to transplantation, surveillance against aberrant cells such as cancer cells, and autoimmunity; Inherited and acquired immune deficiencies. A survey of the cellular and molecular elements that constitute the immune system. This will provide the basis for an analysis of cellular interactions and molecular mechanisms which support protective immunity and will be considered in the context of dysregulated immune responses associated with autoimmunity and states of immunodeficiency.

**Topics**

- Innate Immunity, Complement and Receptors
- Hematopoietic and Lymphoid Tissues
- Immunoglobulin Structure
- Antigen-Receptor Interactions
- Generation of Antibody and T cell Receptor Diversity
- MHC Class I and MHC Class II Genes and Proteins
- Antigen Processing and Presentation
- Signal Transduction by Antigen Receptors and others
- B and I lymphocyte cell Development and the generation of diversity
- T Cell Development
- Lymphocyte Maturation and Survival
- T Cell Activation
- T Cell Mediated Immunity
- B Cell Activation
- Immunoglobulins and Immunoglobulin Receptors
- Cytokines and Chemokines
- Allergy
- Autoimmunity
- Immunological tolerance, Transplantation and Rejection
- Immunological Tolerance
- Tumour Immunology
- Inherited Immune Deficiencies
- Acquired Immune Deficiencies

**Email for all queries related to this course.**

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# MIMM 323 Microbial Physiology and Genetics

## Description

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.

**3 credits — Fall Term**
**Pre-requisite:** Biology of Microorganisms **MIMM 211**
**Lectures:** MWF 11:35 a.m. - 12:25 p.m.

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syllabus_micro_phys_fall_2012.pdf

concept_diagram_14_june_2012.pdf

## Details

### Course Coordinator

Dr. Greg Marczynski
Duff Medical Building
Room 506
Tel: (514) 398-3917
Fax: (514) 398-7052
Email

### Lecturers

Dr. J.W. Coulton

Dr. B. Turcotte

### Evaluation

- Quiz (3 x 3% each) 9%
- One in-class examination 31%
- Final Examination 60%

### Texts and required readings

*Microbiology: An Evolving Science* (Second Edition)
Slonczewski, Foster and Gillen, 2011 W W Norton
Option to buy text (McGill Bookstore)

### In Depth

A broad introduction to the physiology of microorganisms. The chemical activities of microbes and their interaction with the environment will be studied from a basic knowledge of microbiology and biochemistry.

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**Topics**

- Anatomy of bacterial cells
- Function of bacterial cell parts
- Proteins of bacterial membranes
- Outer membranes of Gram negative bacteria
- Assembly of peptidoglycan
- Action of penicillins
- Bacterial transport mechanisms
- Group translocation; ABC transporters
- Protein targeting
- Bacterial motility and chemotaxis
- Signal transduction in bacterial chemotaxis
- Exchange of genetic information in bacteria
- Overview of metabolism and assembly reactions
- Polymerization reactions
- Biosynthetic pathways in bacteria
- Physiological adaptive responses in the biosynthetic pathways: control of enzyme activity
- Fueling reactions in bacterial metabolism
- Cellular differentiation in bacteria
- Microorganisms and their environments
- Bacterial genetics: physiological adaptive responses involving regulation of gene expression
- Regulation of gene expression in bacteria
- Multi-gene regulatory systems for controlling gene expression in bacteria
- Control of bacterial gene expression by "two-component" regulatory systems
- Translation as a regulatory control point
- Yeast: overview, cell structure and protein sorting
- Regulation of gene expression in yeast
- Yeast as a tool in molecular biology
- Yeast mating and switching
- Physiological adaptive responses to nutrient availability in yeast: role of RAS and adenylate cyclase
- Yeast cell cycle

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# MIMM 324 Fundamental Virology

## Description

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.

**3 credits — Fall Term**
**Pre-requisites:** Biology of Microorganisms **MIMM 211**, **BIOL 200** Molecular Biology , **BIOL 201** Cell Biology & Metabolism , or [BIOC 212]
**Lectures:** MWF 09:35 - 10:25

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## Details

### Course Coordinator

Dr. Greg Matlashewski
Duff Medical Building
Room D17
Tel: (514) 398-7479
Fax: (514) 398-7052
Email

### Lecturers

Dr. G. Matlashewski

Dr. C. Liang

Dr. J. Teodoro

Dr. J. Archambault

Dr. A. Mouland

Dr. D.J. Briedis

### Topics

- Introduction to virology
- Structure and classification of viruses
- Simple DNA-containing animal viruses: parvoviruses and papovaviruses
- More complex DNA viruses: adenoviruses, herpesviruses, poxviruses
- Positive-strand RNA viruses: picornaviruses, flaviviruses, coronaviruses
- Negative-strand RNA viruses: orthomyxoviruses, paramyxoviruses, rhabdoviruses
- Viroids and viroid-like agents
- Prions and bovine spongiform encephalitis
- Retroviruses: structure, replication mechanisms, strategies of gene expression

2005-2006 Evaluations
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- Cellular transformation and tumorigenesis by retroviruses
- Human immunodeficiency virus and AIDS
- Antiviral chemotherapy
- Hepatitis B virus

### Grading

- One midterm test on October 12th. The test represents 35% of the final grade.
- Final exam covers only the second half of the course, and represents 65% of the final grade.

### Textbook

- **Fundamentals of Molecular Virology** by **Nicholas H. Acheson** (Editor), Publisher: John Wiley & Sons, 2007; a compilation put together by current and former instructors of the course. The textbook follows the material presented in many lectures, and supplements it. You are encouraged to read chapters assigned to more fully understand each topic, preferably before each lecture. You will not be expected to know details of information on topics that are not discussed in the lectures.

### Web

- The course schedule, updates and news, and lectures can be accessed through Web CT.

### Supplemental Information

Three excellent advanced virology textbooks are available:

- Fundamental Virology, 4th edition (2001), edited by D.M. Knipe and P.M Howley, Lippincott Williams and Wilkins.
- Principles of Virology (2000), by S.J. Flint, L.W. Enquist, R.M Krug, V.R. Racaniello, and A.M. Skalka, ASM Press.
- Viruses and Human Disease (2002), by J.H. Strauss and E.G. Strauss, AP

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# MIMM 386 Laboratory in Microbiology and Immunology

## Description

This course presents the student with a series of illustrative exercises in bacterial classification, bacterial and viral genetics, molecular genetics and cell anc molecular immunology. The objective is to provide a practical introduction to microbiological and immunological research and technology, including the creation of a research proposal and preparation of research reports.

**6 Credits - Fall and Winter Terms**
**Pre-requisites:** Biology of Microorganisms **MIMM 211**, Laboratory in Microbiology **MIMM 212**
**Co-requisites:** Immunology **MIMM 314**, Microbial Physiology and Genetics **MIMM 323**, Fundamental Virology **MIMM 324**
**Lecture:** M 2:35-3:25 pm in the Duff Amphitheatre
**Laboratory:** W 1:35-5:25 pm in the Duff lab cubicles
**Follow-up:** F 1:35-2:25 pm in the Duff lab cubicles (as required)

**mimm_386_outline_2012-13.pdf**

**NOTE: First lecture FRIDAY, 2 September at 2:30 pm in the Duff Amphitheater.**
**Laboratory manuals will be available at a cost of $20 each beginning August 29th. An email with purchasing details will be sent out to registered students .**

## Details

### Course Coordinator

Dr. Sylvie Fournier
Duff Medical Building
Room 603
Tel: (514) 398-7273
Fax: (514) 398-7052
Email

### Lecturers

Dr. D. Briedis
Dr. B. Cousineau
Dr. S. Fournier
Dr. A. Koromilas
Dr. C. Krawczyk
Dr. G. Marczynski
Dr. S. Richard
Dr. S. Vidal

## Evaluation

- Term Paper: 15%
- Lab Reports: 20%
- Bioinformatics Project: 5%

2005-2006 Evaluations
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- Lab Exam: 60% (3 module examinations @ 20% each)

MIMM 386 Term Paper Evaluation Worksheet
[MIMM386Term_paper_evaluation_worksheet.xls - MS Excel - 30 KB]

## Course Text

Laboratory Exercise in Molecular Biology, Baines, Couture, Koromilas and Richard (Dept.)
Laboratory Exercises in Microbiology, Marczynski, G. (Dept.)
Laboratory Exercises in Immunology, Baines, M.G. (Dept.)

## Topics

22 Laboratory Exercises (Final content subject to revision):

1. Protein assays: standard curves and protein quantitation;
2. Plasmid mini-prep, restriction fragment digestion and gel analysis;
3. Determination of insert orientation by the polymerase chain reaction;
4. Preparation of competent *E. coli* and transformation with plasmid DNA;
5. Bacterial expression, extraction and purification of GST-fusion protein;
6. SDS polyacrylamide electrophoresis and immuno-detection of GST-fusion proteins;
7. Yeast Two-hybrid System to detect protein-protein interactions; transfection of yeast;
8. Measurement of β-galactosidase activity in transformed colonies and liquid cultures;
9. Medical microbiology: gram-Positive Bacteria: *Staphylococcus*;
10. Medical microbiology: gram-Positive Bacteria: *Streptococcus and Enterococcus*;
11. Medical microbiology: gram-Negative Bacteria: *Enterobacteriaceae*;
12. Microbial genetics: *Caulobacter molecular biology and genetics*;
13. Microbial genetics: *Caulobacter screening for antibiotic resistance*;
14. Microbial genetics: *Caulobacter screening with reporter LacZ plasmids*;
15. Microbial genetics: *Caulobacter screening for transcription regulation mutations.*
16. Influenza virus hemagglutination and hemagglutination inhibition assays;
17. Enzyme-linked immuno-sorbant assay of immunity to influenza (ELISA);
18. Immunohistology to detect cellular antigens in tissues.
    1. Fluorescent antibody cytometry and sorting (FACS, DEMO);
19. Qualitative and quantitative immunoprecipitation (Ouchterlony, Mancini);
20. Assays of mouse macrophage phagocytosis.
    1. Macrophage migration assays (Chemotaxis, DEMO);
21. Cytotoxicity assay of Natural Killer cells in mouse spleen.
22. Plaque assay for antibody forming B-cells from immunized mice.
    1. Spleen and Thymus cell proliferation assays (3H-Thymidine uptake, DEMO):

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# MIMM 387 The Business of Science

## Description

This course gives you an applied perspective of the scientific and medical world today. You will first realize the real "business" behind major science initiatives by understanding the controversies associated with the human genome project. By discovering the businessman/scientist Craig Venter, it will become clear just how closely science can be related to business. The first part of the course also addresses many intricate issues within the research and development domain of medical science. We will discuss the topics of patents, clinical trials, and vaccine development from practical and bioethical points of view. The second part of the course will compare and contrast the cultures of large pharmaceutical companies versus the biotechnology industry. From start-up companies to well-established big pharma, you will learn the legal and financial challenges that are linked with critical stages of translating basic research to commercialized drugs. Canada's healthcare system will be compared with those in other countries, and legal challenges associated with healthcare related infection outbreaks will be explored. Alternative views in medicine, such as the anti-vaccine movement and various conspiracy theories on science will be considered.

This course is designed to develop the student's critical thinking and to be interactive. By this, we mean that active exchange between students and lecturers during and after the presentations is expected. Students will be given the contact information of lecturers to provide an opportunity for follow-up, especially in a case where a student selects the area of expertise of the particular lecturer as their topic for the final term paper.

**3 credits — Winter Term**
**Pre-requisites:** At least one 200-level biologicial or biomedical discipline or permission of instructor.
**Lectures:** M/F 11:35 a.m. - 12:55 p.m.
**Location:** Duff Medical Building THTR1

syllabus_2012.pdf

## Details

### Course Coordinator

Dr. R. Murgita
Duff Medical Building
Room 408
Tel: (514) 398-3927
Fax: (514) 398-3033
Email

### Lecturers

Dr. Murgita and a selected panel of researchers from Universities, industry and related law-professions as well as individuals involved in the commercial drug discovery process (industrial managers, patent attorneys, regulatory affairs experts, bioethicists, etc.).

**Evaluation**

2005-2006 Evaluations
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- Term paper: 55%
- Quizzes: 30%
- Participation: 15%

**Readings**

*As assigned or provided by lecturers*

**Course Rationale**

The trend is that an increasing numbers of University graduates will pursue careers in companies that focus on biotechnology and biopharmaceutical related industries with jobs in the technical, clinical, regulatory, legal, or management segment of that field. Most undergraduates acquire a solid foundation in the basic sciences. There is, however, a significant gap in the preparation of students for the real world of biopharmaceutical and related fields. To help fill the gap this course intends to offer students the opportunity to interact, question, and network with experts from private sector, to understand the relationship between academia and industry. Students will be exposed to lecturers with applied research backgrounds, as well as to industrial scientists and managers, bioethicists, patent attorneys, experts in the regulatory affairs of drug discovery and more.

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Department of Microbiology and Immunology



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MIMM 509

# MIMM 396/397 Undergraduate Research Project in Microbiology and Immunology

## Description

This course is intended to introduce undergraduate Science students to fundamental laboratory research. This course contains a significant research component that requires substantial supervised research work by the student and the submission of a final written report worth 50% of the final grade. The Supervisors' evaluation of the students' research performance will determine the remaining 50% of the grade. A copy of the research report should be sent to the course coordinator, Prof. G. Marczynski.

Note that 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. Students should find a supervisor in the Department of Microbiology and Immunology willing to supervise a MIMM 396 project. Available projects may be posted on the Office for Undergraduate Research in Science (OURS) website 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.

Microbiology and Immunology students must obtain the permission of a departmental professor to provide a project and supervise their research. To be eligible for MIMM-396, students must have taken at least one term of undergraduate Science studies including MIMM-212 or equivalent laboratory course, have a CGPA of at least 3.0, or permission of the research supervisor to waive these requirements. The project proposal form is appended below. The MIMM 396 form must be completed by the student and the project supervisor and approved by the course coordinator; Dr. Greg Marczynski (Phone: 514-398-3917, Greg Marczynski ) before the start of the term. The course workload must involve at least 9 hours of research activities per week for 13 weeks.

**NOTE:** Use MIMM 396 for Microbiology projects and MIMM 397 for Immunology projects.

Students are not permitted to take MIMM 396 under the S/U option.

Professors wishing to offer research projects to undergraduate students can post their completed project forms with appropriate project-specific prerequisites and the project description through the Office for Undergraduate Research in Science website.

**3 Credits - Fall, Winter or Summer Terms**
**Pre-requisites:**Laboratory in Microbiology **MIMM 212** (or equivalent), **BIOL 200** Molecular Biology
**Co-requisites: BIOL 201** Cell Biology & Metabolism
**Laboratory:** 9 hours per week as approved by the research supervisor

**Project Application Form** http://www.mcgill.ca/science/research/ours/396/form/

## Details

**Course Coordinator**

Dr. Greg Marczynski
Lyman Duff Medical Building

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3775 University St., Room 506
Montreal, QC H3A 2B4
Tel: (514) 398-3917
Fax: (514) 398-7052
Email

**Format**

The written text of the research report shall be a minimum of 10 numbered pages with 1-inch margins, 1 ½ line-spacing and 12-point type Times New Roman font. The paper will include a Title page, Introduction, Results and Discussion, Summary, Reference list and any appendices. The title page, list of references, and data tables or figures that you refer to in your discussion should be appended to the paper but are not included in the 10 page text limit. Submit copies of your paper to your supervisor and the course coordinator by the last day of classes in the term.

**Evaluation**

- Written research reports: 50% (Evaluated by the supervisor and one other professor). **Research Report Evaluation Form [.xls]**
- Laboratory research performance 50% (Evaluated by the research supervisor). **Laboratory Performance Evaluation Form [.xls]**
- Research supervisors must submit their grades to the course coordinator by the end of the examination period.

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# Department of Microbiology and Immunology



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## MIMM 413 Parasitology

### Description

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.

**3 credits - Winter Term**
**Pre-requisites:** MIMM 314 Immunology; **ANAT 261** Intro to Dynamic Histology is also **strongly** recommended
**Lectures:** T/Th 09:35 - 10:25
**Laboratory:** R 12:35 - 14:25
**Pre-Lab:** R 10:35-11:25

mimm_413_2013.pdf

### Details

#### Course Coordinators

Dr. G. Matlashewski
Duff Medical Building
Room D17
Tel: (514) 398-7479
Fax: (514) 398-7052
Email

#### Lecturers

Dr. G.Matlashewski
Dr. M. Ndao
Dr. M. Olivier
Dr. F. Dzierszinski
Dr. T. Geary
Dr. P. Rohrbach
Dr. M.T. Shio

**Evaluation**

- Mid-Term Examination (Multiple Choice Questions): 25%
- Final Examination (Written Questions): 55%
- Laboratory Exam: 20%

**Course Text**

**Recommended text:**
Foundations of Parasitology, Schmidt and Roberts, Brown Publishers.

**Reference texts:**
Animal Agents and Vectors of Human Diseases, P.C.Beaver and R.C. Jung. Lea and Febinger.
Tropical Medicine, G.W. Hunter, J.C. Swartzwelder, D. Clyde.
Manson's Tropical Diseases, C. Wilcocks, P.E.C. Manson-Bahr

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**In Depth**

This course has been designed to impart knowledge about one of the important groups of human pathogens collectively known as parasites. Examples of human parasites which are endemic in Canada along with those which are of global importance will be discussed.

The lecture material will include the natural history, epidemiology, distinctive biological characteristics, microscopic and submicroscopic structures and functions of selected examples of parasites that colonize different organ-systems of the host. Biochemical and immunological factors involved in the pathogenesis of parasitic diseases will be presented to illustrate diversity in the "functions" of endoparasites. To complement the course material, two to three lectures have been added to examine the molecular action of anti-parasite drugs on parasites.

The laboratory component will cover four areas. DNA-based speciation of certain protozoan parasites, microscopic identification of both blood and intestinal parasites and the sero-diagnostic procedures.

**Topics**

- Symbiosis to parasitism: parasite, host, community
- Malaria; biological aspects; immunological and pathophysiological aspects in malaria
- Leishmaniasis: disease spectra and immunopathology
- Chagas' disease
- Opportunistic pathogens: toxoplasmosis and pneumocystosis and cryptosporodiosis
- Intestinal protozoa: Amebiasis and Giardiasis
- Genetic basis of antigenic variation in protozoan infection
- Significance of evasion mechanisms in protozoa infection
- Echinococcosis
- Cerebral and generalized cysticercosis
- Ascariasis and visceral larva migrans
- Hepatosplenic, intestinal and urinary schistosomiasis
- Intestinal nematodiasis: immunological mechanisms of worm expulsion
- Cytokines: their roles in parasitic diseases
- Intestinal and hepatic amebiasis
- Lymphatic filariasis
- Trichinosis
- Significance of eosinophilia in helminthiasis
- Parasite-host cell molecular interaction

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**Updated on** *Wed, 2012-08-22 16:34*

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Department of Microbiology and Immunology



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# MIMM 414 Advanced Immunology

**Description**

An advanced course serving as a logical extension of MIMM 314. The course will integrate molecular, biochemical and cellular events involved in innate and adaptive immune responses. It will provide the student with an up-to-date understanding of a rapidly moving field.

**3 credits - Fall Term**
**Pre-requisites:** Immunology MIMM 314
**Lectures:** MWF 11:35 - 12:25

## outline_mimm_414_2012-13.pdf

## Details

### Course Coordinator

Dr. Sylvie Fournier
Duff Medical Building
Room 603
Tel: (514) 398-7273
Fax: (514) 398-7052
Email

### Lecturers

Dr. N. Arbour Email
Dr. N. Fodil-Cornu Email
Dr. C. Krawczyk
Email
Dr. M. Olivier
Dr. Marina Shio Email
Dr. J. Zhang Email
Dr. F. Dzierszinski
Dr. J. Fritz
Dr. N. Labrecque
Dr. C. Piccirillo
Dr. W-K. Suh

**Evaluation**

Mid-term and final written examinations requiring essay-type answers.

- Mid-Term Examination: 20%
- Final Examination: 50%
- Term paper: 30% (detailed examination of a topic in Immunology based on recent publications)

**Course Text**

Current scientific literature

**Topics**

- Toll-like receptors
- Regulation of NK cell activity
- Host-pathogen interactions

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- Subversion of the host immune responses by intracellular parasites
- Ontogeny and function of dendritic cells
- Autoantibodies in health and disease
- Molecular interactions between the T cell receptor and MHC molecules
- Immune synapse
- Polyspecificity of T cell receptor recognition
- Molecular mimicry and epitope spreading
- The B7/CD28/CTLA-4 co-stimulatory pathway
- The extended CD28/B7 family
- T cell memory
- Peripheral tolerance and regulatory lymphocytes
- Animal models of immune dysregulation
- Interactions between the immune and the nervous systems

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**Updated on** *Wed, 2012-08-22 09:56*

**Department of Microbiology and Immunology**
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# MIMM 465 Bacterial Pathogenesis and Host Defenses

## Description

Organized by the Department of Microbiology and Immunology, 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.

Lecturers in this course include members from the Department of Microbiology & Immunology, The Institute of Parasitology, the McGill Centre for the study of Host Resistance, Montreal General Hospital, Institut Armand-Frappier, and the Jewish General Hospital.

**3 credits - Fall Term**
**Pre-requisites:** Biology of Microorganisms **MIMM 211**, Immunology **MIMM 314**, Microbial Physiology and Genetics **MIMM 323** (or permission from the instructor)
**Lectures:** MWF 10:35 - 11:25

**mimm465revisedfall_2011.pdf**

## Details

### Course Coordinator

Dr. Hervé Le Moual
Duff Medical Building
Room 503
Tel: (514) 398-6235
Fax: (514) 398-7052
Email

### Lecturers

Dr. M. Behr Dr. A. Berghuis
Dr. A. Dascal Dr. A. Descoteaux
Dr. H. Dokainish Dr. F. Dzierszinski
Dr. S. Gruenheid Dr. D. Nguyen
Dr. M. Olivier Dr. M. Reed
Dr. B. Ward

### Evaluation

Mid-term examination requiring essay answers.

- Mid-term Exam: 30%
- Final Exam: 70%

### Course Text

*Bacterial Pathogenesis: A Molecular Approach*, third edition (2011); B.A. Wilson, A.A. Salyers, D.D. Whitt and M.E. Winkler. ASM press, Washington, D.C., USA.

### Topics

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- Host response to bacterial infection
- Role of the commensal microflora
- Bacterial strategies for evading host defenses
- Antimicrobial compounds and resistance to antibiotics
- Specific examples of host-pathogen interactions: *Staphylococcus aureus, Streptococcus pyogenes, Pseudomonas aeruginosa, Mycobacterium tuberculosis, Bacillus anthracis, Helicobacter pylori, Salmonella enterica, Legionella pneumophila* and *Escherichia coli.*

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# MIMM 466 Viral Pathogenesis and Host Defences

## Description

A study of the biological and molecular aspects of viral pathogenesis with emphasis on the human pathogenic viruses including the retrovirus HIV; herpes viruses; hepatitis viruses; viral respiratory infections; viral diarrhea; viruses and cardiovascular disease; new emerging human viral diseases. These viruses will be discussed in terms of virus multiplication, gene expression, virus-induced cytopathic effects, host immune response to infection and therapies.

**3 credits - Winter Term**
**Pre-requisites:** Biology of Microorganisms **MIMM 211**, Immunology **MIMM 314**, Fundamental Virology **MIMM 324**
**Lectures:** TR 02:35 - 04:25pm

**mimm466_course_outline_2012-13.pdf**

## Details

### Course Coordinator

Dr. A. Gatignol
Lady Davis Institute
Room 523
Tel: (514) 340-8222 x.5284
Fax: (514) 340-7576
Email

### Course Co-Coordinators

**Dr. D.J. Briedis**
Duff Medical Building
Room 502
Tel: (514) 398-3925
Fax: (514) 398-7052
Email

**Dr. Chen Liang**

Lady Davis Institute
Room 326
3755 Côte Ste-Catherine Road
Montreal, QC H3T 1E2
Tel: (514) 340-8260
Fax: (514) 340-7537
Email

### Evaluation

- Mid-term exam: 30%
- Essay: 30%

2005-2006 Evaluations
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- Final Examination: 40%

**Recommended Text**

Fundamentals of Molecular Virology (Paperback, 405 pages) by **Nicholas H. Acheson** (Author) Price: $62.97 CDN (with free shipping on Amazon.ca) Publisher: John Wiley & Sons (December 2006)

**Topics**

- Humoral and cellular immunity to viruses
- Innate and antibody dependent cellular immunity
- Cell mediated immunity to virus infected cells
- Viral immunopathology
- Molecular biology of interferon and cytokine activation
- Cytokine signal transduction
- Virus-induced pathologies
- AIDS: Pathogenesis, transmission prevention
- Anti-viral chemotherapy and drug resistance
- Molecular biology of HIV-1: Regulatory and accessory genes
- HIV-1 replication and assembly
- Herpes viruses
- Hepatitis viruses
- Influenza, SARS and respiratory infections
- Viral diarrhea
- Viruses and cardiovascular disease
- Emerging viruses
- Gene therapy against and with viruses

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MIMM 509

# Library Research Project in Microbiology (MIMM 499) and Immunology (MIMM 498)

## Description

This research course involves supervised exploration of the current scientific literature on an assigned topic of an advanced nature and submission of a term paper for evaluation. Upon consultation with the course coordinator, the student can choose or will be assigned a Professor of the Department of Microbiology and Immunology with appropriate expertise within the general areas of Bacteriology, Virology, Immunology or Parasitology to act as their supervisor. The Professor, in consultation with the student and the course coordinator, will assign a research topic, supervise the students' library research and evaluate the written term paper.

**This course can only be taken in U3**

**1 credit, 3 hours per week, U3 Fall or U3 Winter term.**
**Pre-requisites:** Laboratory in Microbiology and Immunology **MIMM 386**, Bacteriology **MIMM 323**, Virology **MIMM 324**, Immunology **MIMM 314**

## Details

**Course Coordinator**

Dr. Silvia Vidal
McGill Life Sciences Complex
Bellini Building, Room 367
Tel: (514) 398-2362
Fax: (514) 398-7052
Email

The term paper shall be a review of original papers in the recent scientific literature on the assigned topic. Recent literature published within the last 5 years shall include a minimum of 10 to 20 journal articles from which you will select, display and discuss relevant data.

**Format**

The written text of the term paper shall be a minimum of 10 numbered pages with 1-inch margins, 1 ½ line-spacing and 12-point type Times New Roman font. The paper will include a Title page, Introduction, Results and Discussion, Summary, Reference list and any appendices. The title page, list of references, and data tables or figures that you refer to in your discussion should be appended to the paper but are not included in the 10 page text limit. Submit copies of your paper to your supervisor and the course coordinator by the last day of classes in the term.

**Evaluation**

The term paper will be graded out of 100% by your term paper supervisor and one other Professor based on organization, clarity or expression, completeness of coverage of the topic, neatness in preparing the text and illustrations, proper citation of references and formatting of the reference list, and evidence of a comprehensive search for recent and relevant papers in the literature. Supervisors must submit their grades to the course

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coordinator by the end of the examination period.

**MIMM 498/499 Term paper evaluation worksheet**
[MIMM498_499Term_paper_evaluation_worksheet.xls - MS Excel - 35.5 KB]

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Department of Microbiology and Immunology



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# MIMM 501/502 Honours Research Project

## Description

Students who will enter their final year of undergraduate studies in the Department of Microbiology and Immunology are encouraged to consider Independent Studies in Microbiology and Immunology, MIMM 501/502 D1, D2. The course is an intensive 12-credit program of study and research in the laboratory of one of the professors of the Department. **The number of places is limited.** To qualify for registration in this course, students must have a CGPA of 3.5 or higher.

**12 Credits - Fall and Winter**

MIMM_501-502 Course Outline_2012-2013.pdf

**Course Coordinator**

Dr. J.W. Coulton
Duff Medical Building
Room 403
Tel: (514) 398-3929
Fax: (514) 398-7052
Email

**Registration**

An information meeting about the course MIMM 501/502 D1, D2 is held annually in January for students who intend to apply for registration. They must state to the course coordinator their intention to register and provide documentation which supports their eligibility. This should consist of an up-to-date unofficial academic transcript and a letter stating areas of research interest (Microbial Physiology/Genetics, Virology, or Immunology). Documents should be submitted to Jennifer DiMassimo, Student Affairs Officer, by February 10.

During the month of February, professors in the Department of Microbiology and Immunology will indicate the number of undergraduate students whom they are willing to accept into their laboratories for the coming year. A list of these professors will be posted. Students are then required to contact a prospective supervisor and to obtain his/her approval for registration. Each student will report this arrangement to the Student Affairs Officer on or before May 1st. This will be conveyed through a letter of agreement between the supervisor and the student, which will include a description of the proposed research project, and will be signed by both parties. The course coordinator must approve all such arrangements prior to registration.

**NOTE:** Use MIMM 501 for projects in Immunology. For all others use MIMM 502.

**Research Project**

The professor who acts as supervisor will direct the research project and will provide laboratory space, materials and supplies for the project. Because this is a 12-credit course, students are expected to devote at least 40% of their academic effort towards their research. The nature of the project is determined by consultation between the professor and the student.

2005-2006 Evaluations
2004-2005 Evaluations
2003-2004 Evaluations
2002-2003 Evaluations
2001-2002 Evaluations
Financial Support
Admissions
Advising
Advising Videos

To help students in the organization of the research project, each student is required to submit a written research proposal to the course coordinator by mid-January. This proposal will be returned to the student's research advisor for discussion with the student.

Students are required to write a final research report (maximum 30 typed, double-spaced pages) in the form of a scientific manuscript, to be submitted end of April.

Course time and tutorials will be dedicated to scientific writing, using software for reference management, and creating effective scientific presentations.

**Grading**

1. **10%** of the final grade will be assigned by the course coordinator for attendance and active contributions at seminars and tutorials.
2. **10%** of the grade will be assigned to the Proposal, due early January. Expectations for the proposal will be delivered at one of the autumn seminars by the course co-ordinator.
3. **35%** of the final grade will be assigned by the professor who directs the project. This grade will be based on an assessment of the performance of the student and will consider the student's efforts, abilities, and success in research. A written evaluation by the professor will be requested by the course coordinator and this evaluation will be transmitted to the student.
4. **25%** of the grade will be assigned to the final written report. Two copies of the report must be submitted to the course coordinator five (5) days before Student Research Day of the Department of Microbiology and Immunology. The report will take the form of a scientific manuscript and will include Title Page, Abstract, Introduction, Materials and Methods, Results, Discussion, Literature Cited, Figures and Tables. The Instructions to Authors are those of the American Society of Microbiology (A.S.M.) and are found in the January issue of all journals published by the A.S.M. The report will be graded by a professor who is not the supervisor of the project and who is familiar with the general research area of the student's project. Written comments by the evaluator will be encouraged.
5. **20%** of the grade will be assigned to the oral presentation. All students must present their research findings at Student Research Day. This event will be scheduled in early May just after final examinations. A title for the presentation must be submitted to the course coordinator by mid-April. The research presentations will be evaluated by professors. The Department makes an award to the student who delivers the best presentation at Student Research Day.

Printer-friendly version

**Classified as** 502 coulton course honors honours immunology laboratory microbiology mimm mimm502 Research study undergraduate

**Updated on** *Mon, 2012-08-06 14:49*

**Department of Microbiology and Immunology**
Room 511, Duff Medical Building
3775 University Street
Montreal, Quebec H3A 2B4
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Fax: 514-398-7052; [Email]

Sign in (site maintenance)

Department of Microbiology and Immunology



Graduate studies

Undergraduate studies

Programs

Undergraduate Research Conference

Courses

MIMM 211

MIMM 212

MIMM 214

MIMM 314

MIMM 323

MIMM 324

MIMM 386

MIMM 387

MIMM 396/397

MIMM 413

MIMM 414

MIMM 465

MIMM 466

MIMM 499/498

MIMM 501/502

MIMM 509

# MIMM 509 Inflammatory Processes

## Description

This seminar/reading and conference course concentrates on the innate immune response, autoimmunity, and current research into the inflammatory response, areas not adequately covered by the other immunology courses presented at the University. Given in conjunction with the Division of Experimental Medicine, this course promotes interactions between guest researchers (from McGill and other universities) and students. **Please note there is a cap of 17 students.** Classes are given at the Lyman Duff Building

**3 credits - Winter Term**

**Recommended Prerequisite:** Immunology MIMM 314

**Recommended Co-requisites:** Cellular Immunology PHGY 513; Advanced Immunology MIMM 414

**Lectures/Seminars:** T 10:35 - 12:55

**Location:** Lyman Duff building, Room C14 (unless otherwise indicated)

**mimm_509_2012_schedule_120711.pdf**

## Details

**Course Coordinators**

**Dr. Joyce Rauch**
Montreal General Hospital
Tel: (514) 934-1934, ext. 42149
Fax: (514) 934-8239
Email: joyce.rauch@mcgill.ca

**Dr. John Di Battista**
Royal Victoria Hospital
Tel: (514) 934-1934, ext. 34401
Fax: (514) 289-8542
Email: john.dibattista@mcgill.ca

**Course Lecturers**

Dr. Frank Beier
Dr. Mohit Kapoor
Dr. Amit Bar-Or
Dr. Timothy Brewer
Dr. Elizabeth Fixman

2005-2006 Evaluations
2004-2005 Evaluations
2003-2004 Evaluations
2002-2003 Evaluations
2001-2002 Evaluations
Financial Support
Admissions
Advising
Advising Videos

Dr. Ines Colmegna
Dr. Salman Qureshi

**Evaluation**

- 20% on oral presentation
- 20% term paper
- 20% on presentation of the assigned papers
- 20% on class participation
- 20% on midterm examination

**Readings**

- 2 assigned papers per session, TBA

**Topics**

- cellular changes/response to injury
- inflammatory mediators
- acute phase response
- spectrum of diseases with an inflammatory component

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**Classified as** microbiology mimm 509

**Updated on** *Mon, 2012-01-09 12:08*

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# 12. CAREER AND EMPLOYMENT OPPORTUNITIES

**CAREER AND PLACEMENT SERVICES**

McGill University offers Career and Placement Services for its students. This service provides information regarding summer employment, preparing a curriculum vitae, contacting various governmental agencies, and employment opportunities in chosen fields. Counsellor's, are available to answer questions at the office, which is located in the Brown Student Services Building, Suite: 2200, 3600 McTavish St., Montreal, H3A 1Y2, telephone no.: 398-3304.

**FUTURE OPPORTUNITIES**

A degree in microbiology provides an excellent basis for entering professional and postgraduate programs in biomedical research, education, medicine, dentistry, and the veterinary sciences. Many opportunities exist for careers in pure or applied microbiology and immunology, medical microbiology, environmental microbiology, and biotechnology. They include positions in industry (pharmaceutical, agri-food, service and biotechnology), hospitals, universities, research institutes, and government (environment, public health and energy).

The following is a list of the major categories of employers in Microbiology and Immunology.

| CATEGORY (EXAMPLE) | PROJECT AREAS |
|---|---|
| BIOLOGICAL INDUSTRIES (Cedarlane) | Monoclonals, Biological Products |
| ENERGY INDUSTRIES (Petrocan) | Waste Management, Petro-chemicals |
| ENVIRONMENT LABORATORIES (Department of Environment) | Environmental Analysis and Monitoring |
| FERMENTATION INDUSTRIES (Labatt, Seagram, Agropur) | Production and Quality Control |
| FOOD INDUSTRIES (Maple Leaf) | Quality Control, Meat, Bakeries, etc. |
| HEALTH AND WELFARE (Government of Canada) | Drug, Food Additives Evaluation |
| HOSPITALS (Royal Victoria Hospital) | Diagnostic, Research |
| LABORATORIES (Bioresearch) | Product Testing |
| MEDICAL LABORATORIES (Provincial Health Labs) | Vaccination, Pathogen Analysis |
| MEDICAL & SCIENCE SUPPLY COMPANIES (Fisher Scientific) | Marketing, Product Support |
| MUNICIPAL LABORATORIES (Sewage Management) | Waste Management |

| CATEGORY (EXAMPLE) | PROJECT AREAS |
|---|---|
| PHARMACEUTICAL COMPANIES (Merck Frosst Canada Inc.) | Research, Marketing |
| PULP AND PAPER INDUSTRIES (Paprican) | Waste Management, Fermentation |
| UNIVERSITIES (McGill University) | Teaching, Research |
| WATER RESOURCES (Provincial Water Resources) | Water Contamination Analysis |

The following are partial lists of mostly Quebec-based employers, divided by category, who offer employment opportunities in the biomedical, biotechnological and microbiological fields.

## LIST 1 - HUMAN AND VETERINARY HEALTH CARE

| NAME | PROJECT AREAS |
|---|---|
| AMERSHAM PHARMACIA CANADA INC. Baie d'Urfe | Health care, ophthalmic, diagnostic and biotechnological products |
| BIO-MÉGA INC. Laval | Pharmaceutical test kits |
| BIO-MÉGA DIAGNOSTIC INC. Laval | Diagnostic kits |
| BIO-RESEARCH LABORATORIES LTD. Senneville | Various |
| BRISTOL MYERS PHARMACEUTIC GROUP Candiac | Pharmaceuticals |
| CANADIAN MEDICAL RESEARCH ASSOC. INC. Montreal | Biomedical research |
| CONTINENTAL PHARMA CRYOSAN INC. Montreal | Vaccines, plasma derivatives, diagnostic kits |
| FRAPPIER DIAGNOSTIC INC. Laval | Diagnostic kits, cell cultures |
| BIOCHEM IMMUNOSYSTEMS INC. Laval | Chemical products, veterinary and diagnostic products |
| JOHNSON & JOHNSON INC. Montreal | Absorption products |

| | |
|---|---|
| MEDICORP INC.<br>Montreal | Diagnostic kits,<br>monoclonal antibodies |
| MERCK-FROST CANADA INC.<br>Kirkland | Pharmaceutical and<br>veterinary products |
| NORDIC LABORATORIES INC.<br>Laval | Anti-ulcerus,<br>anti-hypertensive medication |
| OMEGA LABORATORIES INC.<br>Montreal | Diagnostics, treatment of<br>allergies |
| QUÉLAB LABORATORIES INC.<br>Montreal | Cell cultures |
| RHÔNE-POULENC PHARMA INC.<br>Montreal | Antibiotics and pharmaceuticals |
| RICHELIEU BIOTECHNOLOGIES INC.<br>Sainte-Hyacinthe | Peptide synthesis |
| ROUGIER-BIOTECH INC.<br>Montreal | Carcino embryonic antigenes,<br>monoclonal antibodies |
| SOFICORP SCIENTIFIC INC.<br>Ville St. Laurent | Diagnostic kits |
| SQUIBB CANADA INC.<br>Montreal | Cardio-vascular medication |

**LIST 2 - AGRI-FOOD**

| NAME | PROJECT AREAS |
|---|---|
| ACTOL CHEMICALS LTD.<br>Delson | Starch modification, polymers<br>and polyvinyls |
| AGRINOVE ARGI-FOOD COOPERATIVE<br>Sainte-Claire | Concentrated and evaporated milk, UHT milk and<br>juices, milk powder, butter, cheese |
| AGROPUR AGRI-FOOD COOPERATIVE<br>Granby | Cheese, yogurt, butter, milk, ice cream<br>fruit drinks |
| A. LASSONDE & FILS LTD.<br>Rougemont | Fruit juices, vegetable juices, fruit drinks |
| CENTRE D'INSÉMINATION ARTIFICIELLE<br>DU QUÉBEC (C.I.A.Q.) INC.<br>Sainte-Hyacinthe | Frozen semence of bull and animal<br>embryo |

| | |
|---|---|
| CHAMPLAIN INDUSTRIES LTD.<br>Stanbridge Station | Food additives, protein, skimmed and concentrated milk, beer yeast |
| DELISLE FOOD INC.<br>Boucherville | Cheese, yogurt, sour cream, concentrated milk, milk powder |
| FROMAGES SAPUTO LTD.<br>Montreal | Cheese |
| JOSEPH E. SEAGRAM & SON LTD.<br>LaSalle | Ethylic alcohol, alcoholic beverages |
| LABATT BREWING COMPANY LTD.<br>Montreal | Beer, draught, beer yeast |
| LABRADOR LAURENTIENNE INC. | Natural Spring Resources |
| LACTANCIA LTD.<br>Victoriaville | Milk powder, butter, cheese |
| LANTIC SUGAR LTD.<br>Montreal | Sugar |
| LIBERTY BRAND PRODUCT INC.<br>Brossard | Cheese, yogurt, butter, cream |
| MOLSON BREWERIES OF CANADA LTD.<br>Montreal | Beer, draught, beer yeast |
| NUTRINOR AGRI-FOOD COOPERATIVE<br>Chambord | Food additives |
| OGILVIE MILLS LTD.<br>Candiac | Food additives and preservatives, glucides, vegetal proteins |
| PURDEL AGRI-FOOD COOPERATIVE<br>Bic | Dairy products and derivatives, bakery marine products, animal food |
| ROLMEX INC.<br>Boucherville | Lactic cultures |
| ROSELL INSTITUTE INC.<br>Montreal | Freeze-dried lactic cultures |
| SCHENLEY CANADA LTD.<br>Valleyfield | Alcoholic beverages |
| SEMICO INC.<br>Sainte-Rosalie | Seeds |

## LIST 3 - FORESTRY AND PULP & PAPER

| NAME | PROJECT AREAS |
|---|---|
| ABITIBI CONSOLIDATED<br>Montreal | Pulp and paper |
| DOMTAR INC.<br>Senneville | Pulp and paper, forestry products, fine chemical products |
| IOGEN INC.<br>Montreal | Forestry biomass valorization, enzyme |
| NORANDA INC.<br>Pointe-Claire | Metal and forestry products |
| PREMIER ENTERPRISES CDN LTD.<br>Rivière-du-Loup | Peat moss, biofilter, compost, peat-based culture media |
| PULP AND PAPER RESEARCH INSTITUTE OF CANADA (PAPRICAN)<br>Pointe-Claire | Pulp and paper, effluent treatment |
| REED LTD.<br>Québec | Pulp and paper, fine chemicals |
| RHIZOTEC LABORATORIES INC.<br>Saint-Jean Chrysostome | Microbial biofertilizers for agricultural plants and forestry |
| SERRES A.M. DION INC.<br>Boisbriand | In vitro culture of ornamental plants, vegetables and trees |

## LIST 4 - ENVIRONMENT

| NAME | PROJECT AREAS |
|---|---|
| CANADIAN LIQUID AIR LTD.<br>Montréal | Assisted oil recovery, pulp and paper, waste water treatment |
| DEGRÉMONT INFILCO LTD.<br>Montreal | Water treatment equipment |
| ECO-RECHERCHES INC.<br>Pointe-Claire | Biological treatment of effluent |
| JOHN MEUNIER INC.<br>Montreal | Effluent treatment |
| SANIVAN INC.<br>Montreal | Environmental protection, treatment of toxic industrial wastes |

## LIST 5 - CONSULTING AND ENGINEERING SERVICES

| NAME | PROJECT AREAS |
|---|---|
| MONENCO LTD.<br>Montreal | Process engineering |
| RECBIOMINE INC.<br>Montreal | Metal biolixiviation |
| ROCHE LTD.<br>Sainte-Foy | Environmental engineering |
| SNC LAVALIN GROUP<br>Montreal | Process and environmental engineering |
| SPECTREX LTD.<br>Montreal | Bioreactor |
| TEKNIKA GROUP INC.<br>Sherbrooke | Industrial waste treatment |

## LIST 6 - MAJOR CANADIAN BIOTECHNOLOGY EMPLOYERS

| NAME | PROJECT AREAS |
|---|---|
| ADRIA LABORATORIES CORP.<br>Mississauga, Ontario | Pharmacology |
| ALLELIX INC.<br>Toronto, Ontario | Diagnostic<br>Growth Factors<br>Therapeutic Drugs |
| BIO CAN INC.<br>(Jackson Immunoresearch)<br>Mississauga, Ontario | Immunochemical |
| BIOMIRA INC.<br>University of Alberta<br>Edmonton, Alberta | Immunodiagnostics<br>Immunotherapeutics |
| CEDARLANE<br>Hornby, Ontario | Immunochemical |
| CONNAUGHT LABORATORIES<br>Willowdale, Ontario | Pharmaceuticals Ontario (Insulin)<br>Diagnostic (RHO Gamm) |
| PALMYRA RESOURCES CORP.<br>Victoria, B.C. | Cancer Diagnostic |

## LIST 7 - BIOMEDICAL COMPANIES IN THE MONTREAL AREA

ABBOTT LABS LTD.
ADAMS BRANDS LTD.
AMERSHAM PHARMACIA CANADA
ALGENE BIOTECHNOLOGIES
APOTEX INC.
ASTRA PHARMA CANADA
BAYER CANADA
BECKMAN INSTRUMENTS CANADA
BIOAGRAL INC.
BIOCHEM PHARMA
BIOMATRIX
BIOMERIEUX CANADA INC.
BIORECHERCHE CANADA
BIORTHEX
BIOVET
BOEHRINGER MANNHEIM CANADA
BRISTOL-MEYERS SQUIBB
CRYOCATH TECHNOLOGIES INC.
DESBERGERS LIMITED
ELI LILLY CANADA
FISHER SCIENTIFIC
FORMULEX CANADA INC.
GELMAN SCIENCES INC.
GENEKA BIOTECHNOLOGIES INC.
GIST BROCADES/BIO-INTERMEDIARE
HAEMACURE CORP.
HOECUST MARION ROUSSEL CANADA
HOFFMANN LAROCHE LTD.
ICN CANADA
INTERNATIONAL INSTRUMENTS
INSTITUT ARMAND-FRAPPIER
LABOPHARM INC.
LABORATOIRE MICROBIOCHEM INC.
LABORATOIRES BIOPHARM INC.
MALLINKRODT CANADA
MANDEL SCIENTIFIC
MERCK FROSST CANADA INC.
METHYLGENE INC.
NOVARTIS PHARMACEUTICALS CANADA
NOVOPHARM QUEBEC
NYMOX
PERKIN ELMER CANADA
PFIZER
PHOENIX INTERNATIONAL
POLYMER SOURCE INC
QUANTUM BIOTECHNOLOGIES INC.

RHONE-POULENC-RORER
ROUGIER INC.
RTP PHARMA INC.
SABEX INC.
SARSTEDT W CANADA
SCHERING CANADA INC.
SODEXEN INC.
SPINEX MEDICAL TECHNOLOGIES INC.
THERALIPIDS INC.
THERAPEX
UPJOHN CANADA
VWR CANADA
WELLCOME INC.
WYETH AYERST LTD.

## LIST 8 - GOVERNMENT RESEARCH CENTRES

**BIOTECHNOLOGY RESEARCH INSTITUTE (NRCC)**
Montreal

**CAPTAIN BERNIER LABORATORY**
Longueuil

**AGRICULTURE CANADA**

**SAINT-HYACINTHE FOOD RESEARCH CENTRE**
Saint-Hyacinthe

**LAURENTIAN FORESTRY CENTRE**
Sainte-Foy

**ANIMAL PATHOLOGY LABORATORY**
Saint-Hyacinthe

**LENNOXVILLE RESEARCH STATION**
Lennoxville

**SAINT-JEAN-SUR -RICHELIEU RESEARCH STATION**
Sain-Jean-sur-Richelieu

**SAINTE-FOY RESEARCH STATION**
Sainte-Foy

**CENTRE QUÉBÉCOIS DE VALORISATION DE LA BIOMASSE**
Sainte-Foy

**INSTITUT DE TECHNOLOGIE AGRO-ALIMENTAIRE**
Saint-Hyacinthe
LaPocatière

**CENTRE DE RECHERCHE INDUSTRIELLE DU QUÉBEC**
Sainte-Foy

**MONTREAL BOTANICAL GARDEN**
Montreal

## LIST 9 - QUÉBEC UNIVERSITIES

**MCGILL UNIVERSITY**
Montreal
- Sheldon Biotechnology Centre
- Office of Industrial Research
- Macdonald College, Ste-Anne-de-Bellevue

**UNIVERSITÉ DE QUÉBEC**
Abitibi-Témiscamingue
Chicoutimi
Hull
Montréal
- Armand-Frappier Institute, Laval
- Institut National de la Recherche Scientifique (INRS)

Rimouski
Trois-Rivières

**UNIVERSITÉ DE MONTRÉAL**
Montréal
- Industrial Liaison Office
- Clinical Research Institute of Montréal
- Montréal Cancer Institute
- Ecole Polytechnique de Montréal/Technology Development Centre
- Veterinary School of Medicine, Saint-Hyacinthe

**UNIVERSITY OF SHERBROOKE**
Sherbrooke

**LAVAL UNIVERSITY**
Sainte-Foy
- Industrial Liaison Office
- Centre Hospitalier de l'Université de Laval (CHUL)

**CONCORDIA UNIVERSITY**
Montreal

**BISHOP'S UNIVERSITY**
**Lennoxville**