UNIVERSITE PIERRE & MARIE CURIE
LA SCIENCE A PARIS

Immunotechnologies
Développement et Valorisation
Innovations Diagnostiques & Thérapeutiques

Master of Sciences and Technologies
Molecular and Cellular Biology
Specialty in Immunology

Immunotechnologies Master Program IT2006, 2006-2007 (60 ECTS)
Development and valorisation of diagnostic and therapeutic innovations

Program description (10/12/2006)

1. Objectives

To train students in industrial research and innovation within the biosciences.

2. Target public

- Master of Science students
- Doctors, pharmacists, veterinary surgeons, dentists
- Scientists/engineers aiming for a career in R&D in biosciences

3. General organization

First semester:

BMC 532 Specialization « Immunotechnologies » 12 ECTS Weeks 2 to 9	BMC 551IT Scientific Analysis 6 ECTS Weeks 2 to 12	BMC 591IT Project Management 6 ECTS Weeks 2 to 36	Elective Course 6 ECTS Weeks ?

Second semester:

BMC 599IT Internship in a company 30 ECTS Weeks 13 to 36

4. Curriculum

4.1. BMC 532 – Specialisation Course — ***Coordinator: Bertrand Bellier***

BMC532AC "Monoclonal Antibodies" (3 ECTS)	*Coordinator: Sophie Sibéril*

The objective of this course is to approach various aspects of fundamental or industrial research in the field of monoclonal antibody (mAb) development and to integrate them in the economic and legal context.

Programme:

1. The engineering of mAb: from the theory of antigen/antibody recognition to industrial processes (cellular and molecular engineering, optimization of the efficacy of mAb…) including the history of technologies for producing mAb.
2. The industrial transfer of mAb: economical and legal aspects, intellectual property, legal requirements for the production of recombinant proteins and the characterization of mAb.
3. The *in vitro* and therapeutic use of mAb: examples of the use of mAb as tools of analysis, diagnostics or therapeutics. Current stakes of mAb use in human therapeutics (pharmacokinetic and pharmacogenetic).

BMC532CGI "Cell and Gene Immunotherapies" (3 ECTS)

Coordinators: François Lemoine and Bertrand Bellier

The objective of this course is to educate the students in the field of biotherapies, focusing on immuno-interventions (based on immnunological techniques). It covers a range of innovative biotherapies such as: immunotherapies including vaccination, gene therapies, substitute cytotherapies (engraftment of stem cell or differentiated cells). This comprehensive course includes the tools and techniques in immunology and describes pre-clinical and clinical applications.

Program:

1. Tools and techniques in immunology – advanced techniques in flow cytometry, banks of human antibodies, cellular imaging, functional immunological tests, proteomic analysis applied to autoimmunity,
2. Cell therapy – dendritic cells (modulation of immune responses and therapeutic applications), T lymphocytes (TIL et DLI), regulatory T lymphocytes and therapeutic applications, NK, NKT cells, and cellular therapy, mesenchymal cells (GVH and tissue repair),
3. Gene therapy – vectors and viruses, retroviral & lentiviral vectors and therapeutic applications, adenoviral vectors therapeutic applications, AAV vectors and their use for auto-immune uveitis, non-viral gene transfer, siRNA and therapeutic applications,
4. Immunotherapy and vaccination – cytokines and receptors, treatment of malignant hemopathies, new generation vaccines (principles and applications), strategies for HIV vaccination.

BMC532EB "Biotechnology Companies" (3 ECTS)

Coordinator: Stéphanie Graff-Dubois

The objective of this course is to familiarize students with the various actors of the world of biotechnologies. It consists in describing the various stages of the life of a drug from the discovery of the molecule to the application in humans. It is organized in three themes:

- The understanding of the company through concepts of private law, intellectual property, financing, business development and marketing.
- Concrete cases of valorisation of a drug from the molecule to obtaining the marketing authorization.
- Workshop meeting with professionals

Program:

1. The biotechnology company – intellectual property, financing, business development, scientific marketing
2. Drug development – GLP, GMP, clinical trials
3. Professional insertion – SEVE

BMC532AT "Technological workshop" (3 ECTS) *Coordinator: Lydie Féron*

The objective of this course is to offer a practical training for students in, or related to, the field of immunotechnology, for example:

1. BMC458 "Cloning and characterization of recombinant antibodies fragments": Cloning techniques and production of ScFv antibodies (single-chain Fv), various approaches for checking the functionality of the produced monoclonal antibody
2. BMC575 "Immunomonitoring": MHC and MHC/peptide tetramers, analysis of lymphocyte repertoires (immunoscope, quantitative PCR…), functional assays (ELISA/ELISpot, cytotoxicity, adherence, mobility, phenotype…)
3. BMC602 "Advanced flow cytometry": Multicolor phenotypic analysis of cellular antigens on primary murine cells, identification of cell populations, isolation / cloning of dendritic cell populations by magnetic cell sorting and elutriation by flow cytometry, functional tests on sorted cells
4. BMC572 "Gene targeting by RNAi and functional consequences": Extinction of a flagellar gene expression of XXx by RNAi, compared analysis of proteins by a bidimensional gel
5. BMC571 "Bidimentional analysis and mass spectrometry": Bidimensional analysis of cellular proteins in two different conditions
6. BMC579 "Molecular tools": Expression and purification of recombinant proteins, preparation and sequencing of recombinant plasmid and quantitative PCR

4.2. BMC 551IT – Scientific analysis *Coordinator: Sylvain Fisson*

It is a technological and scientific analysis activity, aiming at reviewing a given technology, from its theoretical and fundamental aspects, to the applications, past, current and future, which are made by the industry, academic research and/or medicine. This analysis is carried out on the basis of bibliographical documents and several visits to companies or laboratories that have developed and/or use this technology. This activity can be considered as an initiation to scientific and technological watch in its industrial context.

4.3. BMC 591IT – Project management *Coordinator: Adrien Six*

Each student or group of students will be in charge of a project. Each project is supervised by one of the lecturers and an external consultant. This activity is related to a formal training in project management. This activity comprises steering meetings, intermediate and final reports, and oral defence. For example, this year, the four projects are: 1. Exhibition on immunology-related technologies, 2. Creation of a start-up company, 3. Web site development for the Immunotechnology alumni association, 4. Immunotechnology newsletter.

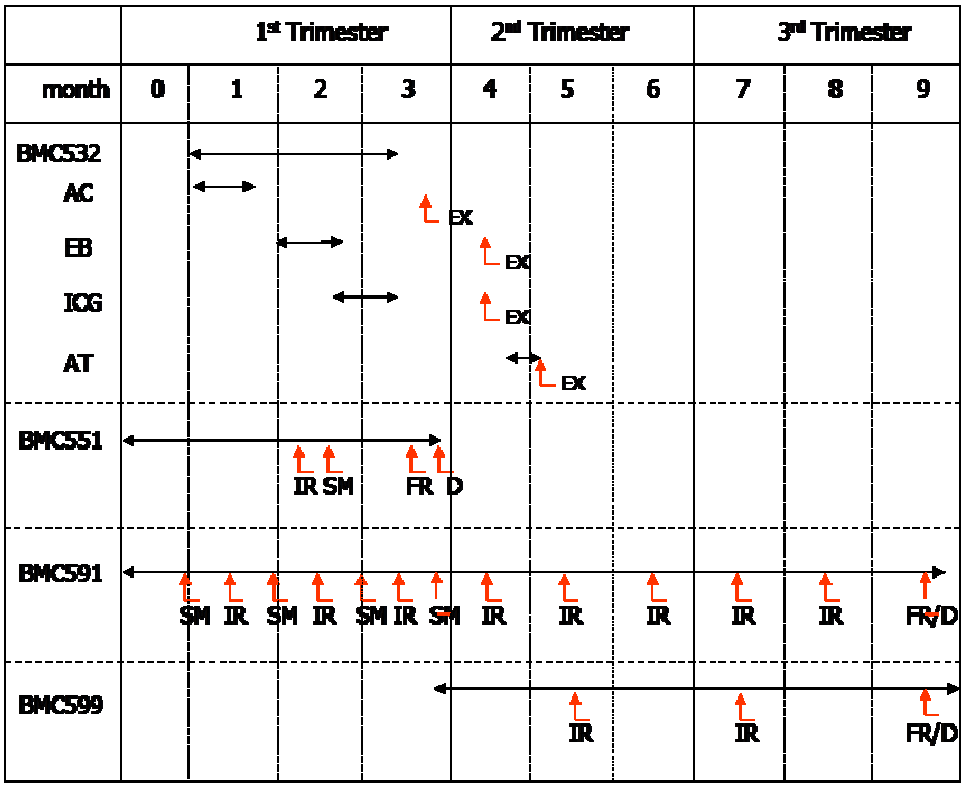
4.4. BMC 599IT – Internship in a company *Coordinator: Isabelle Cremer*

Officially agreed internship in a company (pharmaceutical, cosmetic, biotech, start-up, consulting…) from 6 to 8 months minimum. Training, under the supervision of an internal tutor in the company, can be carried out in the fields of R&D, valorisation of research, counselling… Training can be done in France or abroad.

4.5. Elective course *Coordinator: Lydie Féron*

According to the general framework of the BMC Master curriculum, students have the possibility of choosing one or several elective courses for a total credit of (at least) 6 ECTS. This choice should supplement each student's curriculum to ensure further specialization or opening towards related or complementary topics. It is also an opportunity to train in double competence or to refine a professional project.

5. Overall schedule



IR: Intermediate Report, FR: Final Report, D: Defence, SM: Steering Meeting, EX: Exam

6. Teaching team

This program is based on the competence and the professional experience of lecturers, researchers, industrials, consultants, experts in the field of immunology, of immunotechnologies, of development and valorisation of biomedical innovations, of biotechnology companies… The detailed list of speakers is provided in the documents specific to each activity.

The list below gives email addresses of the teaching team members, in charge with the various activities of the program:

Bertrand Bellier	(BB)	bertrand.bellier@upmc.fr	BMC532, BMC532ICG, Communication
Isabelle Cremer	(IC)	isabelle.cremer@upmc.fr	BMC599, Orientation, Continuing education
Lydie Féron	(LF)	lydie.feron@upmc.fr	BMC532AT, Elective teaching, Schedule
Sylvain Fisson	(SF)	sylvain.fisson@upmc.fr	BMC551, Web site
Stéphanie Graff-Dubois	(SGD)	graff-dubois@cochin.inserm.fr	BMC532EB
Sophie Sibéril	(SS)	sophie.siberil@umrs681.jussieu.fr	BMC532AC
Adrien Six	(AS)	adrien.six@upmc.fr	BMC591, Quality assurance, program director

7. Examinations

Examination is carried out, according to the activities, in the form of written or oral examination, continuous assessment, bibliographical analysis, written reports and final defence. The modalities are indicated in the documents specific to each activity.

Additional information will be found at the following link:

http://adrien.six.online.fr/IT/IT_Examens.html

8. Quality assurance and evaluation of teaching

Quality assurance aims at measuring and improving the quality of teaching but also at checking its adequacy with students' expectations, on the one hand, and the needs and requirements of the job market, on the other hand.

For this purpose, several tools have been developed:

- Teaching is evaluated by students on the basis of a questionnaire, specifying the general appreciation of the course, the achievement of pedagogic objectives, the improvements to be considered;
- A program committee, including students and former students, course speakers (lecturers, researchers, industrials…) and external consultants, will be in charge of evaluating the contents of the proposed activities compared to the needs and the requirements of the job market, and of recommending the desirable evolutions;
- In the light of the results of the questionnaires of evaluation and the program committee recommendations, the organization and content of this teaching will be discussed and around 10% will be modified each year.

The results will be put online at the following link:

http://adrien.six.online.fr/IT/IT_Evaluation.html

A questionnaire of evaluation will be given to each student at the end of the specialisation course BMC532 – Immunotechnologies in order to collect the opinions and the suggestions of the students for the improvement of this teaching. The questionnaire will include several parts (General appreciation, Pedagogy, Organization…). The aim is to evaluate the "contents of teaching" following five levels of satisfaction. To make this evaluation as effective as possible, students will be advised to take note of their appreciation (from 1 to 5) for each activity of the program, in accordance with the attached curriculum.

9. Partnership & Credits

To be defined.

10. Online documentation

The documents relative to this program will be put online on the web site of the immunology specialty of the University Pierre et Marie Curie – Paris 6:

http://www.edu.upmc.fr/sdv/immuno/index.php

Information can also be consulted at the following address:

http://adrien.six.online.fr/IT

11. Information and contacts

In the event of problem, and for any question relative to this activity, please contact:

Adrien Six (adrien.six@upmc.fr, + 33 1 45 68 85 81)
"Immunotechnologies" Program director

For specific questions relative to the schedule, to pedagogic and professional orientation of students, to the communication and the promotion of the program, to the Web site and online teaching resources, to continuing education or to quality assurance and evaluation, the following people should be contacted.

11.1. Schedule — *Lydie Féron (lydie.feron@upmc.fr)*

- Centralisation of schedule information for each course
- Coordination of the activities
- Resolution of possible schedule conflicts and/or logistic problems
- Update and communication of schedule

11.2. Orientation — *Isabelle Cremer (isabelle.cremer@upmc.fr)*

- Pedagogic and professional orientation of the Program students
- Tutor assignment among the members of the teaching team for the follow-up and counselling, targeting the professional project, the search for internship in a company, the choice of elective teachings…
- Creation and administration of a database to ensure the follow-up of the Program alumni

11.3. Communication & promotion — *Bertrand Bellier (bertrand.bellier@upmc.fr)*

- Graphic charter, booklet, brochure, web site…
- Improvement of the visibility and promotion of the program to students and professionals
- Relation of the program with the university administration

11.4. Web site — *Sylvain Fisson (sylvain.fisson@upmc.fr)*

- Development of the structure and contents of the immunology speciality web site
- Production and online publishing of teaching resources
- Improvement of the visibility of the program, and more generally of the immunology speciality (referencing, links, networking…)

11.5. Continuing education — *Isabelle Cremer (isabelle.cremer@upmc.fr)*

- Registration of the « Immunotechnologies » Master Program, and more generally of the immunology courses , in the university catalogue of continuing education
- Promotion of the immunology course offers to our industrial partners
- Creation of a mailing list (former students, industrial partners, organisations…)

11.6. Quality assurance and evaluation *Adrien Six (adrien.six@upmc.fr)*

- Quality assurance
- Creation of common questionnaires of evaluation, analysis and communication of the results
- Indicators for the follow-up, evaluation and evolution of the activities