2013 Laureates

Fabrice Bureau
Université de Liège

Ontogeny and molecular differentiation pathways of lung interstitial macrophages

The lung is a unique immunologic organ that has to process inhaled allergens while not interfering with its primary biologic functions. My laboratory recently identified lung interstitial macrophages (IMs) as important regulators of respiratory immunology. Indeed, IMs may counteract the adaptive immune responses toward inhaled allergens and thus could prevent allergic asthma. This project aims at characterizing the still poorly understood biology of IMs, i.e. their cellular ontogeny and molecular differentiation program. This project thus opens perspectives for a better understanding of the pathophysiology of asthma and for developing novel (immuno)therapeutic strategies for this disease.

Patrice D. Cani
Université catholique de Louvain

Study of the interactions existing between the gut microbiota and the host : impact on the onset of obesity and type 2 diabetes.

Obesity and type 2 diabetes are closely associated with low grade inflammatory tone. We have recently discovered that the gut bacteria (i.e., gut microbiota) were able to modulate the metabolic processes responsible for the onset of the metabolic disorders associated with obesity. The gut microbes interact with the host not only via the immune system (e.g., inflammation) but also via the endocannabinoid system (bioactive lipids) and thereby could potentially control the overall host metabolism. Our project aims at deciphering the molecular mechanisms involved in the interaction between the gut microbiota and the host immune or endocannabinoid systems, at the level of specific organs (intestine, adipose tissue and liver). This molecular characterisation will allow us to identify novel therapeutic targets and/or bacteria that may be useful to treat obesity and type 2 diabetes.

Michel Georges
Université de Liège

Integrating genetics and functional genomics to identify causative genes and variants controlling inherited predisposition to inflammatory bowel disease.

Inflammatory Bowel Disease (IBD), comprising Crohn's disease and ulcerative colitis, are part of a group of inflammatory conditions whose incidence increased quite dramatically over the last century. This is due to as of yet unidentified environmental factors, to which, however, all of us are not equally susceptible: our susceptibility to IBD is highly heritable. During the last five years, one of the major advances in genetics, "GWAS", identified 160 genomic regions that underlie IBD susceptibility. However, the genetic variants within these regions that cause the predisposition, and – most importantly – the genes whose function they perturb remain unidentified. This project aims at identifying the causative genes within GWAS loci that underlie susceptibility to IBD. This is essential as these genes and the pathways in which they integrate are the drug targets of the future.

André Goffinet
Université catholique de Louvain

Mechanisms of brain wiring.

During embryonic development, neurons produce one axon and several dendrites to connect themselves to distant targets and proximal neurons . Many different proteins are implicated in the regulation of axon guidance and dendrite deployment. The team of A. Goffinet has identified some of them and aims at understanding their mechanism of action. To discover how those mechanisms are controlled is requisite to understanding how neural networks and connections are built during embryonic and postnatal development, and how neurons can regenerate and connect new processes following lesions, a key determinant of brain plasticity.

Stanislas Goriely
Université libre de Bruxelles

Transcriptional control of memory CD8 T cell differentiation

A certain type of white blood cells, called cytotoxic T lymphocytes, plays an important role in our immune system. Indeed, upon infection, these lymphocytes rapidely proliferate and destroy the infected cells. After this phase, a small fraction of these activated cells remains in the organism as «memory» cells, allowing the body to react more rapidly and efficiently in a subsequent infection. Memory cells are also at the basis of preventive vaccination. In this project, we will further delineate the molecular mechanisms implicated in differentiation and maintenance of these memory cells. A better understanding of these mechanisms will have a direct impact on the development of novel vaccine approaches, for example against tuberculosis or AIDS virus.

Cédric Govaerts
Université libre de Bruxelles

Structural characterisation of CFTR using nanobodies.

Cystic fibrosis is the most common lethal genetic disease in our countries. There is no cure available to date as current treatments only relieve the severe pulmonary symptoms. However, the genetic origin of the disease has been established for about 25 years and consists in mutations in the gene coding for the CFTR protein. A better understanding of the function of the protein, which is involved in chloride ion transport in the lungs, would open new therapeutic avenues. The goal of this project is to determine the atomic architecture of CFTR to understand the molecular basis of its mode of action. Our strategy involves a Belgian technology called nanobodies, which has been used to solve the structure of other proteins.

Marc Parmentier
Université libre de Bruxelles

Role of leucocyte chemotactic factors in tumor progression

In cancer progression, the immune system and non tumoral cells of the host play an important role. In particular, different populations of white blood cells (leukocyte) can contribute to either the elimination, or the survival and dissemination of tumor cells. In this context, we study molecules controlling the traffic of leukocyte populations, and their influence on tumor development in mouse cancer models. The objective is to determine whether receptors of these molecules can be used as therapeutic targets in the frame of human tumors.

Charles Pilette
Université catholique de Louvain

Impaired mucosal immunity in severe asthma

Asthma is a chronic inflammatory disease of the lungs which affects 5 to 10% of the population worldwide, for which current therapies (mainly based on corticosteroids and bronchodilators by inhalation) are usually effective in controlling symptoms. However, on one hand 10 to 20% of asthmatic patients have a more severe disease responding poorly to treatment, and on the other respiratory infections (mainly by viruses) frequently lead to asthma exacerbations. Our project aims at studying the lung immunity in these cases of severe asthma. In particular, we will explore the possibility that this fragility could be associated with a defect of transport into secretions of IgA, the antibodies naturally lining our mucosal surfaces. We will examine the pathways underlying this potential abnormality of the respiratory epithelium, to be able next to consider a therapeutic approach aiming at restoring this frontline defense of our lung immunity against infections.