UCLouvain

wsbim2181

2026

Molecular and cellular aspects of nutrition

4.00 credits	30.0 h	Q1

Teacher(s)	Cani Patrice (coordinator) ;Lanthier Nicolas ;Veiga da Cunha Maria ;
Language :	French
Place of the course	Bruxelles Woluwe
Main themes	This course aims to study the mechanisms involved in the regulation of cellular activity and metabolism. Different membrane and nuclear receptors as well as transcription factors directly regulated by nutrients and/or their metabolites will be investigated (e.g. : PPAR's, FXR, chREBP, GRP40/120/119/41/43, Toll like receptors (TLR's)). We will also study the mechanisms regulating specific signaling pathways involved in energy homeostasis, lipid and glucose metabolism (e.g., insulin, AMPK, mTOR, ROS).
Learning outcomes	**At the end of this learning unit, the student is able to :** At the end of this course, the students will be able : (1) to understand and to explain the cellular and molecular mechanisms influenced by nutrients (e.g.: different type of lipids, proteins and amino acids, specific carbohydrates) and their cellular metabolites (e.g.: ceramides, DAG, endocannabinoids, ...), 1 (2) to describe the mechanisms regulating gene expression directly connected with energy, glucose and lipid metabolism, (3) to understand the key features regulating physiology and metabolism and that may be involved in the onset of specific pathological disorders such as obesity, type 2 diabetes, metabolic inflammation, cardiovascular diseases, pancreatic and hepatic diseases.
Evaluation methods	**A written exam covering all the themes of the course.** The student must demonstrate their ability to engage in critical and integrative thinking on the topics addressed by the various lecturers. **One point out of twenty (1/20)** will be awarded to the student for active participation and contribution to the debate/discussion.
Teaching methods	The course will be fully given in the auditorium. The team of teachers is composed of professors that have a specific knowledge and complementary expertise in molecular and cellular aspects. Each member of the team will teach themes that are in his field of expertise and for some of them directly developed in their research practice. It is worth noting that this will be coordinated between the different members of the teaching team in order to integrate as much as possible all the different aspects of the course. Finally, this approach will help to maintain the content of the course relatively up to date in this fast moving field.
Content	This course aims to provide students, regardless of their academic background, with the essential knowledge to: 1. **Understand and describe** the molecular and cellular mechanisms modulated by different nutrients, the gut microbiota, and selected metabolites. 2. **Explain the regulation of gene expression**, particularly of genes involved in energy, glucose, and lipid metabolism. 3. **Link major physiological regulations** of metabolism to the mechanisms underlying specific pathologies (obesity, type 2 diabetes, metabolic inflammation, certain cancers, as well as cardio-metabolic, hepatic, and pancreatic disorders). 4. **Analyze the impact of specific nutrients on sports performance and related mechanisms** (lean mass gain, catabolism, endurance, lipolysis). 5. **Develop a critical perspective** on claims regarding certain foods/nutrients and their potential effects on health. The course emphasizes **the study of molecular mechanisms regulating cellular activity and metabolism**. Topics include: • the effects of both energy-providing and non-energy-providing nutrients (lipids, proteins and amino acids, carbohydrates, vitamins, minerals, and trace elements); • the role of the gut microbiota and selected metabolites;

	• the influence of nutrients on membrane and nuclear receptors (e.g., PPARs, LXR, ChREBP, TLRs, GPR40/120/119/41/43) and on key signaling pathways (e.g., insulin, AMPK, mTOR). The role of different foods and their nutrients will be examined **critically, in light of recent scientific research**. Finally, students will participate in a **debate led by two of the professors**, during which discussions will focus on real-world examples of commercially available nutrients/foods and their potential "*effects on health and/or sports performance*".
Inline resources	Several articles from the scientific literature, journals and other materials used for the preparation of the course are made available to students (Moodle).
Other infos	Total hours: Cani P (18h), Van Hul (6h), Lanthier (4h), Veiga Da Cunha (2h)
Faculty or entity in charge	FASB

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Biomedicine	SBIM2M	4		🔍
Master [60] in Biomedicine	SBIM2M1	4		🔍