



Universitat de Lleida

# DEGREE CURRICULUM **NUTRIGENOMICS**

Coordination: CASALI TABERNET, ANDREU

Academic year 2020-21

## Subject's general information

<b>Subject name</b>	NUTRIGENOMICS				
<b>Code</b>	100628				
<b>Semester</b>	2nd Q(SEMESTER) CONTINUED EVALUATION				
<b>Typology</b>	<b>Degree</b>	<b>Course</b>	<b>Character</b>	<b>Modality</b>	
	Bachelor's Degree in Human Nutrition and Dietetics	4	OPTIONAL	Attendance-based	
	Double bachelor's degree: Degree Physiotherapy and Degree in Human Nutrition and Dietetics	4	OPTIONAL	Attendance-based	
<b>Course number of credits (ECTS)</b>	6				
<b>Type of activity, credits, and groups</b>	<b>Activity type</b>	<b>PRALAB</b>	<b>PRAULA</b>		<b>TEORIA</b>
	<b>Number of credits</b>	0.8	1.4	0.8	3
	<b>Number of groups</b>	2	2	2	1
<b>Coordination</b>	CASALI TABERNET, ANDREU				
<b>Department</b>	BASIC MEDICAL SCIENCES				
<b>Teaching load distribution between lectures and independent student work</b>	Hours in class 60 Hours of study at home 90				
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.				
<b>Language</b>	Catalan				
<b>Distribution of credits</b>	Theory 3 Classroom practices 2.2 Laboratory practices 0.8				

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
CASALI TABERNET, ANDREU	andreu.casali@udl.cat	6	

## Subject's extra information

This subject is optional for the fourth year and focuses on giving basic knowledge about nutrigenomics (the effect of the diet on gene expression) and nutrigenetics (what are the genetic differences between the human population that affect nutrient uptake and metabolism) . It is essential to have approved the subject of Biology and Genetics of 1st year to be able to study.

## Learning objectives

- Revise and deepen the concepts, terminology and basic essential mechanisms related to the functioning of the genetic material.
- Obtain knowledge about the regulation of gene expression by nutrients, and how genetic variability determines the effect of these nutrients on metabolism.
- Obtain the necessary technical knowledge to understand the current scientific literature on nutrigenomics and nutrigenetics
- Being able to solve simple problems.

## Competences

### General competences

The graduate in human nutrition and dietetics must:

- Be able to seek and use selectively the sources of information necessary to reach the training objectives.
- Interpret scientific-technical information with a critical sense, and be able to make presentations based on this information.
- Be able to write comprehensible written and oral reports about the work done, with a justification based on the theoretical and practical knowledge obtained (UdL strategic competence).
- Respect the fundamental rights of equality between men and women, the promotion of Human Rights and the values of a culture of peace and democratic values (UdL strategic competence).
- Know and use the scientific and technical vocabulary proper to the different fields of human nutrition and dietetics.
- Work in the laboratory applying quality and good practice criteria.
- Know and know how to use the software and the specific databases in the different fields of human nutrition and dietetics.

### Specific competencies

The graduate in human nutrition and dietetics must:

- To know the biology of living beings in their molecular, cellular, organic and population levels, with emphasis on organisms with a biotech interest.
- Know the biomolecules essential for life and the basic concepts of enzymology.
- Understand the role of genes and their regulation in response to external changes in the cell.

## Subject contents

## 1. Introduction

- Basic genetic concepts.
- Organization of DNA in the cell: the chromosomes. Nucleosomes
- Variation and inheritance; phenotype and genotype; gene, allele and locus; genetic and congenital character.

## 2. The human genome

- The Human Genome, structure levels of the genome
- First source of genetic variability: the replication of DNA.
- Second source of genetic variability: recombination.
- Techniques of analysis of genetic variability

## 3. Regulation of gene expression

- Concept of regulation of gene expression.
- Regulation for the remodeling of chromatin.
- Transcriptional regulation. The transcription factors.
- Gene regulation for nutrients: SREBPs, ChREBPs and nuclear receptors.
- Post transcriptional and translational regulation.

## 4. Epigenetics

- Epigenetic control of gene expression
- Epigenetic modifications: Methylation
- Epigenetic modifications: Post-induce modifications of the histones. Acetylation and Methylation. The genetic imprint
- The influence of the environment. Agouti mice and obesity

## 5. Mutagenesis

- Concept of mutation and polymorphism
- Types of mutations: chromosomal vs. genetic, dominant vs. recessive
- Variations in the name of genes. The case of the AMY1 gene.
- Mutations that affect the metabolism of carbohydrates.
- Mutations that affect the metabolism of amino acids.
- Mutations that affect the metabolism of urea.
- Mutations that affect metabolism of lipid hydrates.
- Mutations that affect energy metabolism (mitochondrial).

## 6. The inheritance

- Heritability in quantitative and qualitative characters. Relative incidence and correlation of twins.
- Morel inheritance. Modes of inheritance: autosomal dominant, autosomal recessive, linked to the X chromosome, maternal.
- Allelic and non-allelic systems. Epistasis

## 7. Genetic diagnosis and analysis techniques

- Type of genetic diagnosis
- Chromosomal diagnosis
- Direct and indirect molecular diagnosis

## 8: Nutrigenomics and diet

- Diet and the microbiome
- Diet and obesity
- Diet and cardiovascular diseases
- Diet and metabolic syndrome
- Diet and cancer

## 9: Genetic determinants

- Risk of hypertension and osteoporosis
- Sensitivity to salt and response to Ca ++
- The metabolism of alcohol and coffee

## Practical activities

### Computer room:

- Databases in genomics
- Identification of inheritance patterns
- Monographic exhibitions

### Laboratory:

Analysis of the diet in tumor growth in a colon cancer model in Drosophila

## Methodology

Type of activity	Description	Hours in class	Groups	Hours professors
Theory	Class	36	2	72
Computer class	Computer practices	16	2	32
Laboratory	Lab practices	8	2	16
<b>TOTAL</b>		<b>60</b>		<b>120</b>

## Evaluation

Continuous assessment will be carried out in accordance with the following criteria:

### 1. Exams (60%).

There will be two tests, which will be worth 60% of the final mark (30% + 30%). The exam will consist of a questionnaire of test questions, theoretical questions of short answer, questions of reasoning or numerical problems.

Practical reports and laboratory work will only be considered if the average mark of the exams is greater than 4.5.

### 2. Monograph (30%)

At the beginning of the course, a series of topics will be proposed and each student will choose one to prepare a monograph. Each student will present a report that will be given to the teacher on the assigned date, and will be worth 15% of the final grade. Each month, each student will do a public exhibition of his work of 30 ', which will be worth 15% of the final grade.

### 3. Laboratory work (10%)

The laboratory work will be evaluated based on the practice book, in which the results will be presented and discussed, as well as answering a series of questions related to the activities carried out during the practice. Assistance to ALL practice sessions is a necessary condition for the work to be taken into account for the purposes of evaluation.

Students can have a tutorial session to review the notes of each block, which will agree with the person in charge of each blog. In no case will be issues related to evaluations outside the assigned sessions or by email.

In the event that following these criteria, a student does not reach the minimum mark of 5.0, he may submit to an extraordinary recovery test, which will be done during the semester's assessment period. In order to be entitled to the extraordinary test, the average mark of the two exams completed during the course must be at least 3.5. The extraordinary test will consist of the resolution of questions of type test (30%) and theoretical questions of short answer, questions of reasoning or numerical problems (70%) of the subject. The final mark of recovery will be the result of pondering the mark of this exam (60%), if it is greater than 4, with that of the monograph and practices of the course (40%).

## Bibliography

**Molecular Biology of the gene.** 6th ed. Watson et al. 2008 Cold Spring Harbor Laboratory Press.

**Genes IX.** 9th ed. Lewin 2008 Jones and Batlett Publishers.

**Lewin's essential genes.** 2nd ed. Krebs et al. 2010 Jones and Batlett Publishers.

**Genetics: analysis of genes and genomes.** 7th ed. Hartl & Jones 2009 Jones and Batlett Publishers.

**Genetics: a conceptual approach.** 3rd ed. Pierce 2008 W.H. Freeman and Co.

**Genetics: analysis & principles.** 3rd ed. Brooker 2009 McGraw-Hill Higher Education.