PERSONALIZED NUTRITION: DIET-GENES INTERACTIONS

Human Nutrition and Dietetic Degree

Course 2026-27

Code: 804018
Module: 7
Subject: Complementary training
Type of subject: Optional
Directed to: Third- and fourth years' students
Department: Nutrition and Food Science
Credits: 3 ECTS
Teaching period: Second quarter
Start date: 19th January 2027
Schedule: Tuesdays from 16,30 to 18,30 h.
Place: Faculty of medicine.
Available places: 40

PROFESSORATE

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BRIEF DESCRIPTION

Single nucleotide polymorphisms (SNPs) and epigenetic and metagenetic differences partly explain the variability of response to diet in the context of health and disease. In addition, food components with a bioactive effect also have an impact in the gene modulation at the cellular level, which ultimately have an effect on human health. Personalized nutrition aims to study the diet-gene interactions in human health to achieve specific diets that fits the individual needs. The knowledge of such interactions will allow for the successful implementation of personalized diets to achieve optimal nutrition, proper and efficient utilization of ingested nutrients, reduce the risk of metabolic and degenerative diseases, and improve treatment effectiveness and adherence.

COMPETENCIES

These correspond to the Module and Subject to which this subject belongs.

General Competences

CG.1.1 until CG 1.4,
CG 2.2,
CG 2.3,
CG 4.1,
CG 4.2,
CG 4.4,
CG 4.5,
CG 8.1

Specific Competences

CE.M7.1
CE.M7.2
CE.M7.3

CE.M7.4
CE.M7.5

AIMS

- To gain a deeper understanding of the concept and implications of the "omics" disciplines.
- To differentiate between nutrigenetic, nutrigenomic, epigenetic, epigenomic and metagenomic.
- To understand the main nutrigenomic, epigenomic and metagenomic effects of dietary nutrients and bioactive compounds.
- Deepen the understanding of nutrigenomics as the basis for the prevention and nutritional treatment in chronic diseases.
- Understanding the importance of genetic polymorphisms in the food selection and choice.
- To interpret the effects of diet on the microbiota and its interaction with host genes.
- Deepen the understanding of functional and transgenic foods for the design of precision diets.
- To study diet-genes-physical activity interaction for the design of personalised diets.
- To propose a "decision tree" for the selection of dietary profiles based on the physical activity and genetic and epigenetic characteristics of the individual.
- To design precision diets for health states and in the prevention of certain degenerative diseases.

CONTENTS

Topic 1: Moving from Nutritional epidemiology to a Balance diet and looking towards Personalized Nutrition.
Topic 2: Basic concept: The importance of the “omics”. Gene candidates. Genome-wide association studies (GWAS) and Epigenome-wide association study (epiWAS). Nutrigenetic, Nutrigenomic, Nutri-epigenetic, Metagenomic. Regulation of gene expression. Transcription factors. Hypo- and hyper-responder to the nutritional diet intervention. Examples.
Topic 3: Role of the genes in food selection. Non-tasters, medium- and super-tasters. Nutritional habits. Chrono-Nutrition: Circadian Rhythm and Personalized Nutrition
Topic 4: Nutrigenomic. Regulation of gene expression by nutrients and bioactive compounds.
Topic 5: Nutritional and genetic strategies for food modification. Functional foods. Transgenic foods.
Topic 6: Polygenic basis of common and prevalent metabolic diseases. Role of diet-gene interactions.
Topic 7: Neurodegenerative diseases. Role of diet-gene interactions.
Topic 8: Nutrigenetic, nutrigenomic and sport. Towards personalization of the athlete's diet
Topic 9: Diet, microbiota and genes. A new perspective on diet personalization.
Topic 10: Application of Nutrigenetics and nutrigenomics to design an optimized and personalized diet.

The program is completed with the elaboration of a monographic topic by the students, which will be related to the program of the subject. The content will be exposed, discussed and evaluated in class and it will be part of the practices of the subject.

SEMINARS

A number of publications and current topics related to the subject will be uploaded to the Virtual Campus during the course, which will be a topic of debate in class.

PRACTICES

- Design of scientific Poster and/or Infograms about important phenotypic and genotypic aspects to be considered for the design of precision diets.
- Design of precision nutrition recommendation for metabolic, degenerative and/or chronic diseases cases by the students. To investigate the currents advantages and limitations. Discussion of strengths and weaknesses, advantages and disadvantages. This aims to ensure that the student becomes a true professional in personalized nutrition.

TEACHING METHODOLOGY

Theoretical classes: Theoretical classes will consist of lectures in which the student will be introduced to the fundamental contents of the subject. Questions will be proposed that exemplify the concepts developed or serve as an introduction to new content. In order to make it easier for the student to follow the lectures, the necessary teaching material will be provided through the Virtual Campus of the subject.

Practical classes and seminars: The practical classes will be oriented to the design by the student, of a poster or infogram about a monographic topic related to diet-genes interactions. In the seminars, various case studies or scientific articles will be analysed in which the contents developed in the lectures will be put into practice.

Tutorials: Students have tutorials at their disposal to resolve any doubts that may arise during their studies. These tutorials will be held in person at the times indicated by each professor.

EVALUATION CRITERIA

- The knowledge of the subject will represent the 60 % of the final mark. A minimum score of 5 out of 10 it will be necessary in any case to pass the test.
- The score obtained in the evaluation of practical skills and seminars will account up to 30% of the final mark (Practical evaluation 20% + Seminars scores 10%). A minimum score of 5 out of 10 it will be necessary in any case to pass the subject.
- The attitude and participation of the student in classes, tutorials, exhibitions, debates, etc., will correspond to the 10% of the final mark.

Note - Actions to be taken in the case of a voluntary or accidental infraction of the rules of conduct of the examination:

"The voluntary or accidental infraction of the rules for the exam will not allow the validation of the exam, so the student will have to take an oral exam of the subject in order to establish his/her knowledge of the subject. If the cheating is confirmed as intentional, it will be considered a very serious ethical misconduct, and the Services Inspection will be informed in order to take the disciplinary measures it considers appropriate".

BASIC BIBLIOGRAPHY

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