

Degree	Type	Year	Semester
4313802 Advanced Genetics	OT	0	1

## Contact

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## Use of languages

Principal working language: english (eng)

## Prerequisites

There are not special pre-requisites in this module

## Objectives and Contextualisation

The objective of this module is to add acknowledgement on the concepts of genetic risk and in the use of biomonitoring data to detect human populations at risk

## Skills

- Demonstrate a mastery of genetic analysis as a transversal tool applicable to any field of genetics.
- Demonstrate responsibility in management of information and knowledge.
- Design and apply scientific methodology in resolving problems.
- Identify and propose scientific solution for problems related to genetic research at both molecular and organism levels and demonstrate an understanding of the complexity of living beings.
- Integrate knowledge of the possible alterations in DNA with their consequences for living beings.
- Students should be capable of integrating knowledge and facing the complexity of making judgements using information that may be incomplete or limited, including reflections on the social and ethical responsibilities linked to that knowledge and those judgements
- Students should know how to apply the knowledge they acquire and be capable of solving problems in new or little-known areas within broader contexts (or multidisciplinary contexts) related to their area of study
- Students should know how to communicate their conclusions, knowledge and final reasoning that they hold in front of specialist and non-specialist audiences clearly and unambiguously
- Use and manage bibliographical information and other resources related to genetics and related fields.
- Use scientific terminology to argue the results of the research and show how to communicate in spoken and written English in an international setting.

## Learning outcomes

1. Apply bibliographical information about rules and legislation in risk assessment.
2. Demonstrate mutagenic properties of agents in relation to levels of prokaryote and eukaryote complexity.
3. Demonstrate responsibility in the management of information and knowledge and in the direction of groups and/or projects in multidisciplinary teams.
4. Demonstrate updated knowledge of the methodology used in determining levels of genetic damage.

5. Differentiate between the risk components associated with changes in DNA and modulations as a result of individual genetic characteristics.
6. Integrate scientific and legal knowledge that enables students to acquire an awareness of the risks associated with changes induced by the DNA molecule.
7. Present summaries and conclusions in public
8. Students should be capable of integrating knowledge and facing the complexity of making judgements using information that may be incomplete or limited, including reflections on the social and ethical responsibilities linked to that knowledge and those judgements
9. Use scientific terminology to argue the results of the research and show how to communicate in spoken and written English in an international setting.
10. Write a report that considers the use of the methodology used in the module to resolve a specific problem
11. Write critical summaries about the taught seminars

## Content

### Theme 1. Genetic damage

Basic concepts. DNA damage vs mutation. Types of genetic damage. Spontaneous vs induced DNA damage. Germinal vs somatic mutations. Consequences for human health.

### Theme 2. Genetic risk

Definitions. Components. Genetic hazards. Genotoxic potency. Exposure. Genetic risk assessment. Risk management.

### Theme 3. Indirect ways to measure genetic damage

Short-term assays classification. Evaluation strategies. Concept of battery. Organisms and assays used to estimate the genotoxic potential.

### Theme 4. Indirect way to measure exposure

Concepts of exposure. Processes for exposure assessment. Exposure and genetic risk. Sources of exposure.

### Theme 5. Human Biomonitoring

Concept of human biomonitoring. Sampling procedures. Use of somatic cells. Use of germinal cells.

### Theme 6. Mutation-Cancer relationship

Genotoxic carcinogens. Non-genotoxic carcinogens. Epidemiological data as a source to detect agents with genotoxic activity

### Theme 7. Biomonitoring and primary DNA damage

Methods to estimate primary DNA damage. The comet assay as a model. Oxidative DNA damage. Role of primary DNA damage in the genetic risk

### Theme 8. Biomonitoring and chromosome damage

Methods to estimate chromosome damage. The micronucleus assay as a model. Usefulness of FISH technologies. Role of chromosome damage in the genetic risk

### Theme 9. Biomonitoring and gene mutations

Molecular analysis of somatic mutations: hprt and HLA. Molecular epidemiology and biomarkers of occupational cancer. Oncogenes and their proteins. The ras gene and the protein p21. The p21 protein as a biomarkers of cancer.

### Theme 10. Biomarkers of individual sensitivity

Biomarkers of interindividual variation. Interindividual variation and genotoxic exposure. Genetic and no-genetic specificity in cancer. Genomic instability.

### Theme 11. Factors modulating the genetic risk

Endogen factors. Basal levels of mutation Other factors. The diet as a modulating factor

Theme 12. Examples of biomonitoring studies

Risk and ionizing radiation. Risk and heavy metals exposure. Risk of pesticide exposures

## Methodology

Lectures will constitute the main part of the course.

For each theme, the student will prepare a written work summarizing one of the papers discussed in the classroom.

Several topics will be explained as a seminars. To cover this topic, the students will receive material to prepare the theme that will be exposed and discussed in the class.

## Activities

Title	Hours	ECTS	Learning outcomes
<b>Type: Directed</b>			
Lectures	110	4.4	1, 2, 3, 4, 5, 6, 8, 9
<b>Type: Supervised</b>			
Seminars	30	1.2	7, 8, 9, 10, 11

## Evaluation

Students must pass a final exam to demonstrate that they have reach an acceptable degree of acknowledge on the different topics discussed in the module. The written responses will constitute the prove of the level reached.

Activity in the class, measured as participation, leadership and quality of the responses will constitute another source of information to reach the final qualification.

From each theme, students must respond to 2-3 questions regarding the topics included in the theme

Finally, students must present and discuss special topics of the module to the rest of the class

## Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Classroom activity	10	1	0.04	5, 8, 9
Exams	40	5	0.2	2, 3, 4, 5, 6, 8, 9
papers review	30	3	0.12	1, 7, 8, 9, 10, 11

**Bibliography**

The student will receive a list of references via Campus Virtual